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February 1971

HANDBOOK OF METHODS FOR INFORMATION SYSTEMS ANALYSTS AND DESIGNERS

Volume II - Appendix II TRACE

Synectics Corporation

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Rome Air Development Center
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James W. Altman   Susan C. Shannon
Alvan W. Leavitt   Stanford T. Hovey

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13. ABSTRACT

A generalizable procedure for the analysis and design of information systems is described in the context of allied and supporting data methods, design assessment, and project management considerations. This procedure follows from a view of information systems development as a complex series of goal-directed iterations, rather than a well-ordered sequence of simple steps. In each iteration, tentative design alternatives are progressively narrowed, better defined, carefully assessed, and revised until a workable, user-responsive solution is operationally activated.

The analysis and design procedure is developed in two forms: (1) a comprehensive discussion of the basic concepts, rationale, and constructive operations supported by detailed flow diagrams; and (2) a simplified, convenient working tool (TRACE), illustrated with two sample system design problems of widely different complexity.

Handbook content and organization were evolved, uniquely, through provisions for systematic evaluation-refinement cycles at selected stages during the period of materials devleopment. Potentially relevant materials were evaluated by a cross section of RADC research and development personnel with extensive practical experience in all facets of information systems development, who used techniques specifically adapted for this purpose. The resultant handbook constitutes a single-source, practice-oriented guide intended for those with formal training in the information sciences, but with little or no experience in military information systems development.

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Volume II - Appendix II TRACE

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APPENDIX II

T R A C E

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TOTAL REQUIREMENTS ANALYSIS
FOR CONCEPT AND ELEMENTS

APPENDIX II

TRACE

Introduction

This Appendix provides a working technique for information systems analysis and design: Total Requirements Analysis for Concept and Elements--TRACE. The technique emphasizes system requirements--very dynamic in nature and usually difficult to define--as the most important aspect of information system design and implementation. The large foldout included with this Appendix II summarizes in illustrative form the entire technique and its main features. It can be seen that one of the primary prerequisites for TRACE to be used effectively is that system management be a central activity in the entire flow of the system analysis effort in order to make important, periodic decisions. Another important aspect of TRACE in guiding a system analysis effort is that the system products be clearly defined as either (1) hardware elements, (2) personnel elements, (3) software elements, (4) facility elements, or (5) support elements.

This Appendix illustrates the application of the tasks and related steps identified in TRACE for analyzing two sample systems. The eight major tasks within TRACE are listed in Figure A2-1, and the essential steps within each major task are listed in Figures A2-2 through A2-9. The order of steps presented may be varied somewhat in actual practice or performed in parallel; however, the tasks are established in a firm sequence with some acceptable latitude for overlapping the beginning of one task before completing the preceding one.

Differences of opinion may arise with respect to specific system elements being categorized in one system element category versus another. For instance, application software documentation or software maintenance training can be categorized as software elements or support elements. Categorizing elements depends on the type of system, its stage of implementation, its direction--whether it is an upgrade effort to an existing system or a

BASIC TASKS WITHIN TRACE:

- o DATA COLLECTION
  - o DATA ANALYSIS
    - o SYSTEM CONCEPT DESIGN
      - o SYSTEM SPECIFICATION DESIGN
        - o BASELINE IMPLEMENTATION
          - o BASELINE SYSTEM EXERCISES
            - o FINAL IMPLEMENTATION
              - o OPERATIONAL ACCEPTANCE

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-1

ESSENTIAL STEPS IN DATA COLLECTION

1) DEFINE SYSTEM FUNCTION
2) DETERMINE INTERFACES
3) DETERMINE SECURITY CRITERIA
4) DETERMINE DATA TYPES
5) DETERMINE DATA VOLUME
6) DETERMINE ORGANIZATIONAL LINKS
7) REVIEW TECHNOLOGY
8) PRODUCT REQUIREMENTS DETAILED

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-2

ESSENTIAL STEPS IN DATA ANALYSIS

1) DETAILED DATA FLOW
2) ANALYZE HARDWARE TRADEOFFS
3) VALIDATE SOFTWARE AVAILABILITY
4) PRODUCTS IN PRIORITY
5) OPERATIONAL FACTORS IN PRIORITY
6) ANALYZE FACILITY NEEDS
7) REVIEW PERSONNEL IMPACT
8) IDENTIFY SUPPORT CONSIDERATIONS

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-3

ESSENTIAL STEPS IN SYSTEM CONCEPT DESIGN

1) ESTABLISH OPERATING CONCEPT
2) DATA PROCESSING NEEDS
3) DATA FLOW ALTERNATIVES
4) MAN-MACHINE INTERACTION
5) DATA BASE DESIGN
6) DEFINE APPLICATION SOFTWARE
7) FUNCTIONAL SYSTEM HARDWARE NEEDS
8) SCENARIO DEVELOPMENT

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-4

ESSENTIAL STEPS IN SYSTEM SPECIFICATION DESIGN

1) HARDWARE ELEMENT CHARACTERISTICS
2) SYSTEM SOFTWARE SPECIFICATIONS
3) APPLICATION PROGRAM SPECIFICATIONS
4) DATA BASE GENERATION PLAN
5) FILE MANAGEMENT SYSTEM SPECIFICATION
6) FUNCTIONAL EQUIPMENT CRITERIA
7) FACILITY PLAN
8) DETAILED MAN-MACHINE OPERATIONS
9) DATA INTERFACE GUIDE

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-5

ESSENTIAL STEPS IN BASELINE IMPLEMENTATION

1) INITIAL HARDWARE INSTALLATION
2) DATA BASE CREATION
3) SYSTEM SOFTWARE MODIFICATIONS
4) APPLICATION PROGRAMMING
5) TEST PROCEDURES
6) TRAINING PLAN
7) REQUIREMENTS SCENARIO FINALIZED
8) SYSTEM SUPPORT STARTED

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-6

ESSENTIAL STEPS IN BASELINE SYSTEM EXERCISES

1) SCENARIO EXERCISING
2) DATA BASE UPDATING
3) PRODUCT TRIALS
4) TEST DATA ANALYSIS
5) TEST DOCUMENTATION
6) DATA FLOW CHECK
7) REQUIREMENTS PRIORITY REVIEW

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-7

ESSENTIAL STEPS IN FINAL IMPLEMENTATION

1) ALL KEY HARDWARE INSTALLED

2) APPLICATION PROGRAMS CHECKOUT

3) DATA BASE COMPLETION

4) USER DOCUMENTATION

5) SYSTEM EXPANSION ACTIONS

6) FACILITIES COMPLETED

7) PERSONNEL TRAINED

9) SYSTEM SUPPORT ON-SITE

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-8

ESSENTIAL STEPS IN OPERATIONAL ACCEPTANCE

1) COMPLETE PRODUCT GENERATION
2) DATA FLOW PROCEDURES SET
3) SYSTEM OPERATING PROCEDURES
4) SYSTEM OPERATING DOCUMENTATION COMPLETE
5) TRAINING DOCUMENTATION COMPLETE
6) ACCEPTANCE TEST DEMONSTRATIONS
7) INTERFACE PROCEDURES
8) EXPANSION OR MODIFICATIONS
9) DATA SECURITY VERIFICATION

Note: Reference large flow chart summarizing TRACE while reading this appendix.

Figure A2-9

new effort, and the background of the people involved in the system analysis project. As the reader reviews the two sample systems and studies the system analysis flow charts of TRACE, it will be apparent that arbitrary decisions were made about these elements. If differences of opinion remain about the elements as categorized here, the sequence of steps or their impact on the system results should not be affected. It is necessary, at a minimum, to (1) identify and examine the system element categories, and (2) firmly decide in what manner each identified system element will be categorized.

TRACE Utilization

The application of the Total Requirements Analysis for Concept and Elements (TRACE) technique of system analysis and implementation is largely dependent upon whether the resultant "system" is relatively simple or complex. Normally, smaller systems can be designed and implemented in a short time period as compared to complex systems which require more development and/or organizational interface activity. In information systems, it is often convenient to categorize a planned system into either a "Short Time to Operational Implementation" (0-3 years) or a "Long Time to Operational Implementation" (3-10 years) frame of reference. This decision can frequently be made during the project establishment or planning phase and certainly by the end of the Data Collection or Data Analysis Tasks within the TRACE sequence of events. Figure A2-10 illustrates the main criteria that are characteristic of these two categories of systems. It is seldom that every criteria will be firmly established at the outset of a system design effort; however, as the initial two tasks are completed (Data Collection and Data Analysis), it must be known whether the program will culminate in an operational capability within either a 3 or 10 year time frame. In fact, user groups need this information in formulating plans for future system operations.

The design team plays a large part in developing a clear understanding of all the criteria shown in Figure A2-10, and can usually assure whether (1) requirements are well defined, (2) close cooperation and interface between

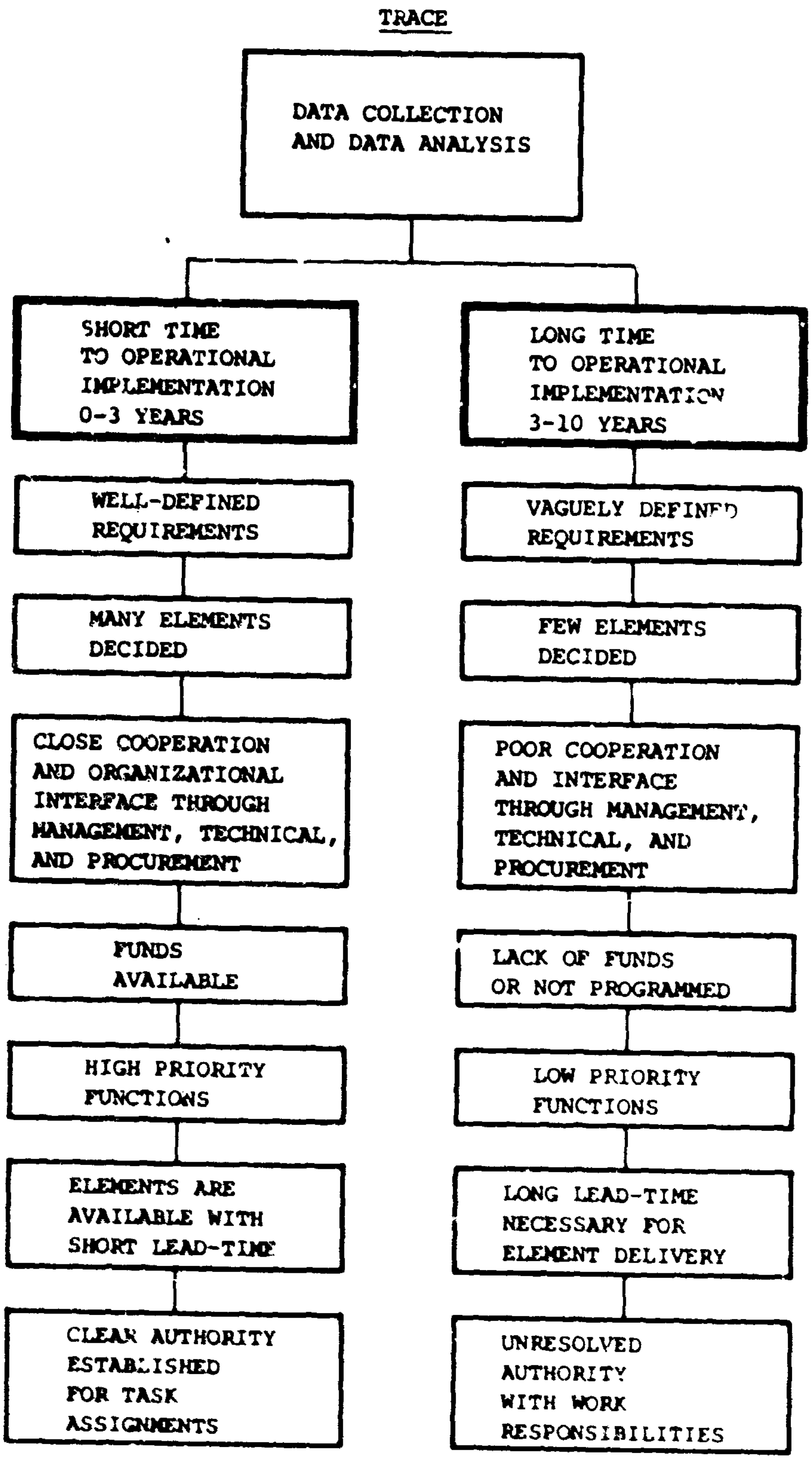


Figure A2-10 Management Categories of System Analysis Projects technical factions are possible, and (3) there is or can be a clear line of authority to accomplish the system design and implementation. The first two tasks within TRACE bring these features of the system into clear focus. Additional features which assist in determining whether a system is categorized as a short- or long-term project are greatly affected by various management levels, the operational situation at the time, and the state of technology. Some of these features are also affected or changed by the design team; however, they should be examined and their character determined as soon as possible.

Assuming that it is possible to place a system in one of these two basic categories from a management standpoint, TRACE can be applied appropriately to assist the system analysis effort. The following pages illustrate in diagram and text form the application of the TRACE technique of system analysis to a short- and long-term system. These two examples describe how the key elements of hardware, personnel, software, support, and facilities can be identified, acquired, installed, and integrated into operation for a range of information systems. TRACE is a guide which assists the system analyst in checking whether the design work is complete as well as in anticipating design steps required of the analyst or a technical design staff working under his direction.

The discussions concerning TRACE are organized according to its relationship to the system elements as indicated in Figure A2-11. Again, the two categories or complexities of systems are discussed to pinpoint where and when the tasks and steps contained in TRACE should be modified or adjusted in sequence as a result of the characteristics of the system problem. These two sample system problems are titled (1) Environmental Infrared Surveillance Reporting System (Short-Term) and (2) Tactical, Integrated Mission Analysis Support System (Long-Term). These titles and their respective descriptions are purely fictitious and are utilized only for illustrative purposes. To approximate operational systems, the system analysis data presented relative to each system are based on actual similar systems; however, the specific characteristics or criteria of the sample systems are synthesized for the purposes of discussing TRACE with specific examples and not

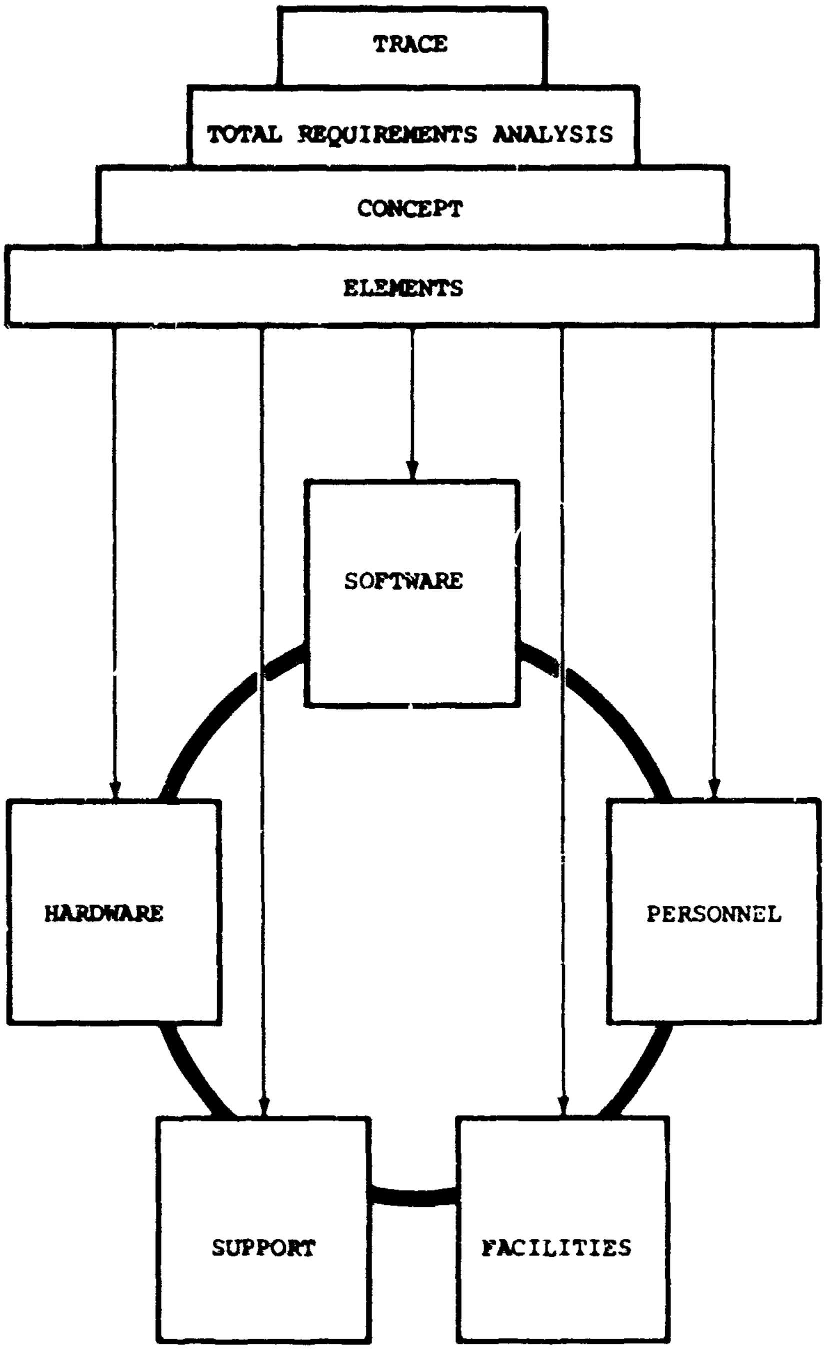


Figure A2- 11. Guide to Descriptive Information for TRACE specifically based on real operational systems. The bounds of each sample system are widely different as shown in Figure A2-12.

Sample System #1 Characteristics

The following conditions exist for the Sample System #1 analysis effort which is aimed at developing and implementing an Environmental Infrared Surveillance Reporting System.

1. The product requirements are well defined and are very straightforward. They consist of a one-page standard pre-formatted alpha-numeric report to be displayed on a CRT console, edited, approved, and stored on a magnetic tape. Only a high-speed printout is required periodically of the magnetic tape records which contain the data as approved at the console and directed for storage. The data are stored and printed serially in the same chronological order as approved.
2. Many elements of the proposed system are defined, including the computer and all peripherals except the CRT console. The facility is defined except for shielding and air conditioning/heating for the consoles and the other computer equipments. The system must be completed for user acceptance at his location in two years. Manpower is available for training at contractor facilities at any time during the two years. Operating and maintenance support items can be made available if identified and ordered within six months of on-site need. No special functional hardware item is needed in addition to the aforementioned computer system with the one CRT console.
3. Close cooperation has existed between individuals at all levels in the development group and the operational user

ENVIRONMENTAL INFRARED
SURVEILLANCE REPORTING SYSTEM
(Short-Term)

- o Display
  - o Edit
    - o Approve
      - o Store
        - o Retrieve Printout

SAMPLE SYSTEM #1 FUNCTIONAL BOUNDS

TACTICAL, INTEGRATED MISSION ANALYSIS
SUPPORT SYSTEM
(Long-Term)

- o Intelligence Data Collection
  - o Data Reduction & Data Extraction
    - o Information Processing
      - o Intelligence Data Handling
        - o Mission Analysis
          - o Command and Control Support
            - o Data Dissemination & Coordination

SAMPLE SYSTEM #2 FUNCTIONAL BOUNDS

Figure A2-12. Relative Difference in Magnitude of Functional Characteristics Between the Sample Systems Presented In Appendix #2.

group for many years. The development group is actually co-located in a building adjacent to the user personnel.

4. Funds have been budgeted, approved, and allocated for procuring the system elements as soon as an approved exhibit is prepared for each item to be purchased, and a plan is developed to guide government preparatory activities in training, facility modification, etc.

5. The system is being installed to accomplish priority functions much faster and more accurately than previously possible. All justification-type staff work has been completed and the decision made to proceed with system design activities, leading to as quick an implementation as possible.

6. All elements are available within the two-years time schedule even if identified and approved only one year ahead of the planned acceptance date.

7. Clear authority has been established for this effort. Procurement, technical responsibility, and management support are all identified by name for both the design-developer group and the user group.

In this particular system, neither the collection of infrared photography nor the extraction of information from the photography is a problem for this system effort since it will be completed by the time this system is used. Only the rapid editing of general data content and positional accuracy within the pre-formatted display are of major concern to the operator in this instance. The primary goal here is to correct some of the previous errors in report composition and speed up the filing of intelligence data onto magnetic tape records for later storage and use. There is no concern for future utilization of the intelligence data after they are filed. It is assumed that the future use of the data is already determined, and that no further interface is needed between this reporting system and the other systems through which the digital data are eventually used or disseminated.

Sample System #2 Characteristics

A completely different situation exists in Sample System #2. The long-term complex, Tactical, Integrated Mission Analysis Support System is comprised of many subsystems or major components which need careful definition and integration at various levels. This type of system might include a many faceted intelligence data collection portion, a data reduction portion, a data extraction portion, an intelligence data handling portion, a mission analysis portion, a command and control support portion, and a communication portion included in its entirety. Depending upon whether the mission analysis is concerned with aircraft, naval ships, or tanks, the overall effort at hand is greatly affected. In any case, the magnitude of technical considerations within this system is much greater than the previous example and certainly requires some variation in the use of the TRACE method. It is important to note, however, that TRACE can still be used as a basic guide and is probably even more advantageous when system problems are complex and very interrelated. TRACE becomes especially useful as more specific details are addressed. It should be noted that increased cooperation and interface is required as the system analysis effort progresses. A deterioration must not occur in this area if success is to be achieved. In addition, TRACE is advantageously employed where the design staff is experienced in the various technical aspects of the envisioned systems. The technique can be used throughout the system analysis effort and at a level of detail required to coordinate the staff's activities, and further, can be used to clarify the design tasks involved in a complex program. The basic characteristics given at the outset for this type of system analysis effort are as follows:

1. The requirements are very numerous and need much further definition because of the magnitude of the functions to be included in this system. The system to be analyzed is basically an Air Force land-based installation in support of offensive aircraft flight operations only over enemy tactical targets that can be moved. As stated above,

this system (by definition from management directives) must include the subsystems for collection of information, data reduction and extraction of data for intelligence, processing of data to perform mission analysis, handling of intelligence to generate various products within the system, and presentation of data to facilitate flight operations command and control functions; and providing capabilities for communicating or disseminating the resultant information for inter-organizational coordination. For the purposes of this example, all interfaces remain within the Numbered Air Force spectrum of interest so that the many inter-service links are avoided. By confining the interfaces, potential security areas that could arise in the technical presentation of operational-type information are eliminated.

2. Very few elements of hardware, software, personnel, facilities, or support are determined for this system at the beginning. When this situation exists in complex systems, the importance of recycling the requirements continually while proceeding through the steps of TRACE cannot be over emphasized. As information is collected about the detailed needs of such a system, some previous or early requirement assumptions are bound to change. As the complexity of the system and the time involved in performing the entire effort increase, greater change can be anticipated. Changes in basic operational mission requirements over time must also be considered.

3. There is average cooperation and interface at all levels between the various groups concerned with developing and implementing the system. It will be necessary for increased interaction to take place between the different groups participating in this effort as more people become involved.

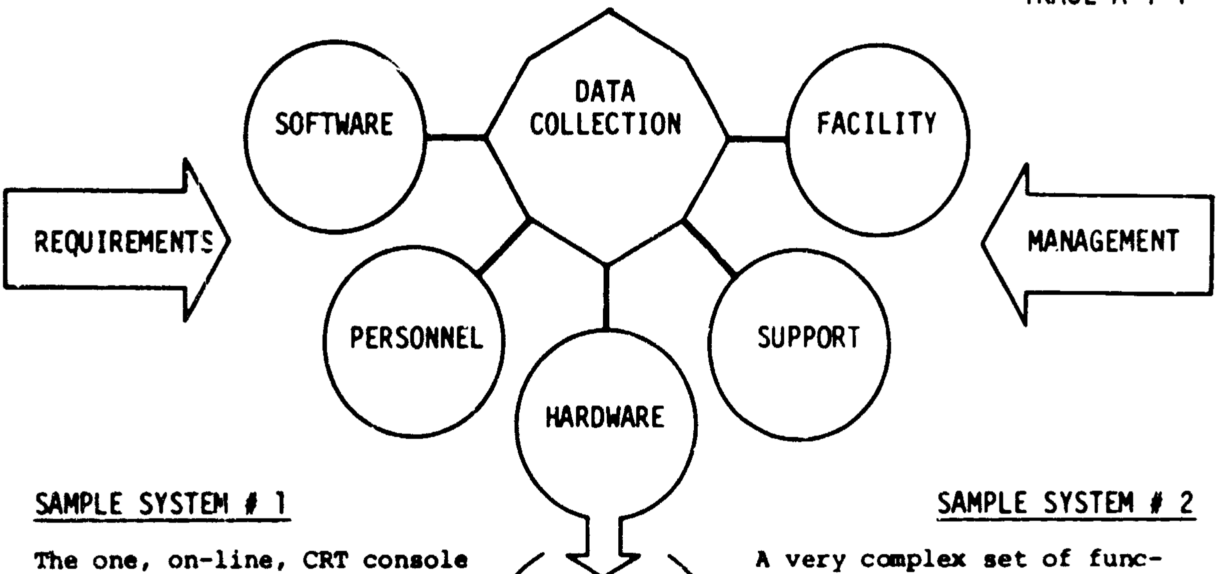
4. Funds have been approved for the first four tasks of system analysis only. During the period of time when these tasks are being conducted, it will be necessary to justify the release of more funds in order to proceed through procurement of the system elements themselves. This is very often the case with many developmental systems and emphasizes the need for complete support documentation at periodic intervals throughout the system analysis effort.

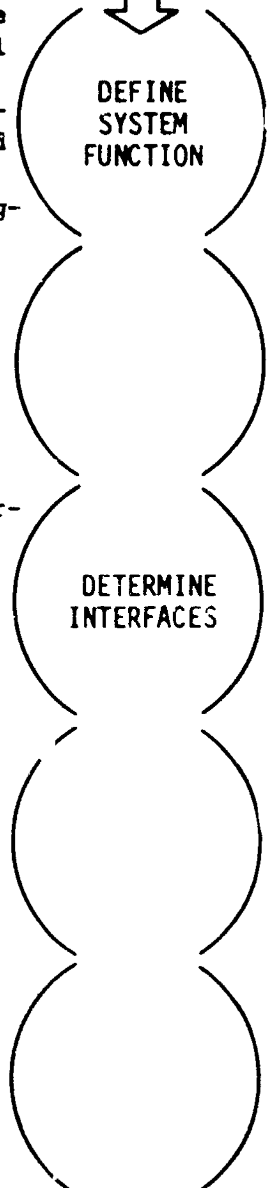
5. The system is being developed to accomplish a high priority mission much faster and more accurately than before possible. This is necessitated by a new generation of tactical aircraft entering the Air Force inventory in the near future.

6. Many hardware and software elements are known to be long lead-time items. Many one-of-a-kind hardware elements will be required even though very few need original research and development. The programming in the data processing area will be significant because of the number of separate functions to be supported for the first time by automated, online computer techniques. A five-to-ten year schedule has been estimated and coordinated through Air Force management channels for this program.

7. Clear technical authority, procurement, and user responsibilities have been decided as far as commands are concerned. The names of all individuals and sub-groups below Air Force Command levels have not been resolved at the outset of this project. This fact requires much coordination effort on the part of the design team and emphasizes the critical need for supporting data throughout the system analysis effort in order to accomplish this coordination.

The remainder of this Appendix is a set of flow charts which contain the tasks involved in performing system analyses. Each task (A-H) illustrates how each of the five sets of system elements, namely, hardware, personnel, software, facility, and support (1-5) are affected by the specific steps included within the related tasks. There is a short narrative description for each step relating how the sample systems and their elements are affected by specific design activities. The format of these pages assists the reader in referencing either the task or the category of system element within any specific task. Each page is labeled with a three-field identifier for index purposes. The first task (Data Collection) is task A, and the hardware elements-related pages are indicated as A-1 with the successive pages indicated by the third number. For example, A-1-1, A-1-2, and A-1-3 illustrate the hardware-oriented effects of the system analysis steps in the Data Collection Task, and A-2-1, A-2-2, and A-2-3 illustrate the personnel effects of the system analysis steps in the Data Collection Task, and so on. This pattern of indexing the TRACE detailed illustrations is maintained throughout the remainder of this Appendix. This same format can be used in actual practice by system analysts in the future. By deleting the text on either side of the center "step indicators" the same forms could be easily used for any system as guides and/or to help record key events.





SAMPLE SYSTEM # 1

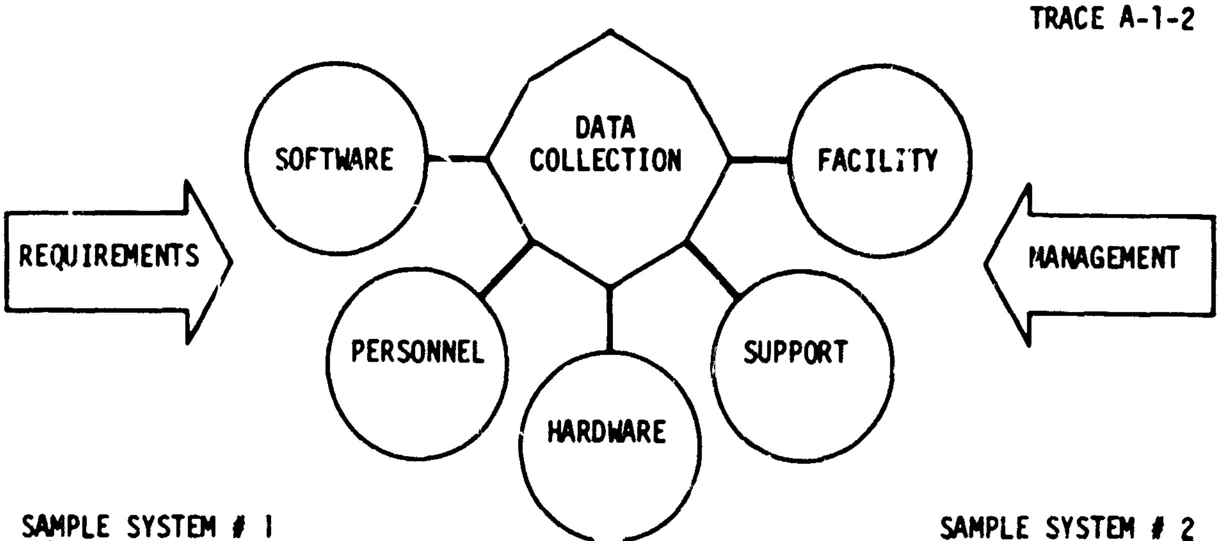
The one, on-line, CRT console work station is most critical for the functional specifications relating to this system. The user operations and data to be handled for editing and approval are very significant and must be understood by the system analyst.

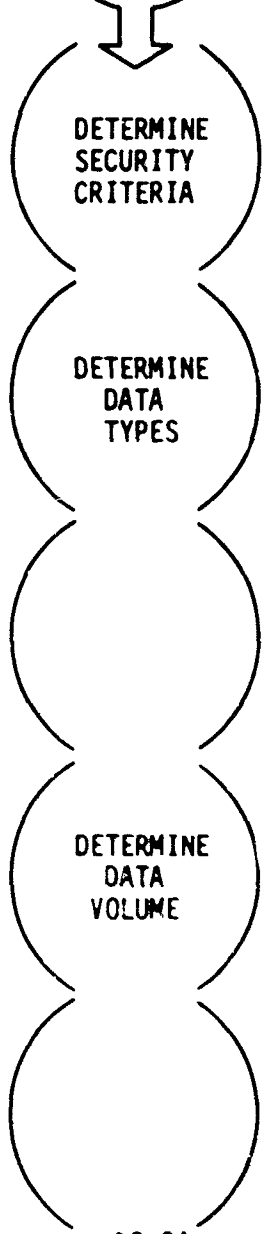
The computer electronic interfaces are the most important in this system problem. The work flow link to the data extraction operation from infrared photography is important to a lesser degree.

SAMPLE SYSTEM # 2

A very complex set of functions must be defined in priority and in a hierarchial order. There are gross operational functions to be described all the way down to the many individual equipment functions that should be listed.

The organizational interfaces need to be defined along with the key equipments with the interface groups The most important hardware interfaces are between the different functional areas within the tactical mission analysis organization itself, i.e., data collection, image processing, digital data reduction, data display for analysis, etc.





SAMPLE SYSTEM # 1

All of the information is completely unclassified and only the possibility of electrical interference should affect the hardware specifications in this case.

The logical and electrical characteristics of the input/output sections of the computer components will be most important as far as the display console is concerned.

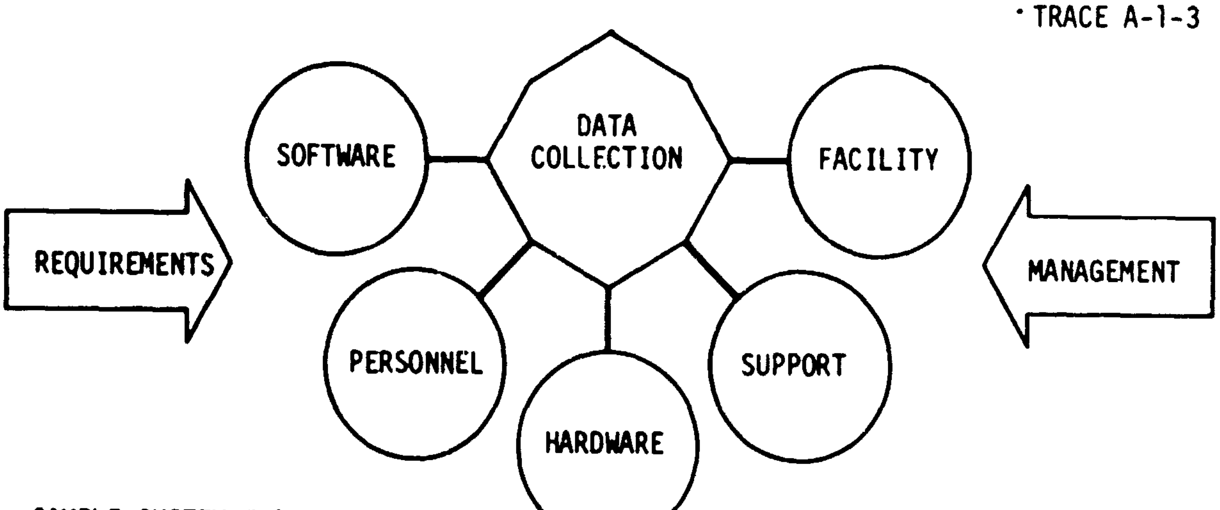
The data rates and volume will determine the data buffering to be implemented. The buffering may occur in the computer component or at the console station.

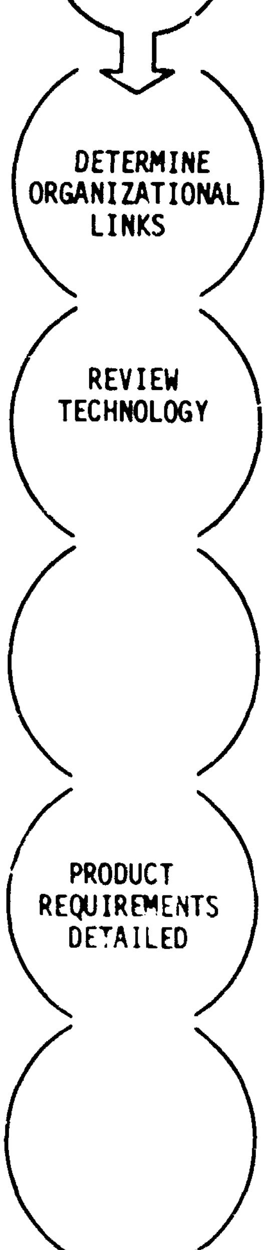
SAMPLE SYSTEM # 2

Since multiple security classification levels of data will be handled, the hardware safety locks, special data converters and internal hardware shielding needs must be considered.

The data will be in photographic hardcopy, textual hardcopy, digital, and audible for this system. Equipment of many types will be needed at various locations for the personnel to perform mission analysis.

High data volumes will be inherent in this system requiring various kinds of data buffering equipments and storage and retrieval devices.





SAMPLE SYSTEM # 1

This step only affects the acquisition policies and procurement aspects of the hardware and other elements of this sample system.

This will determine whether there is an off-the-shelf console to be used as is, a console that can be modified, or whether original development is necessary for the exact display unit configuration to be specified in detail later.

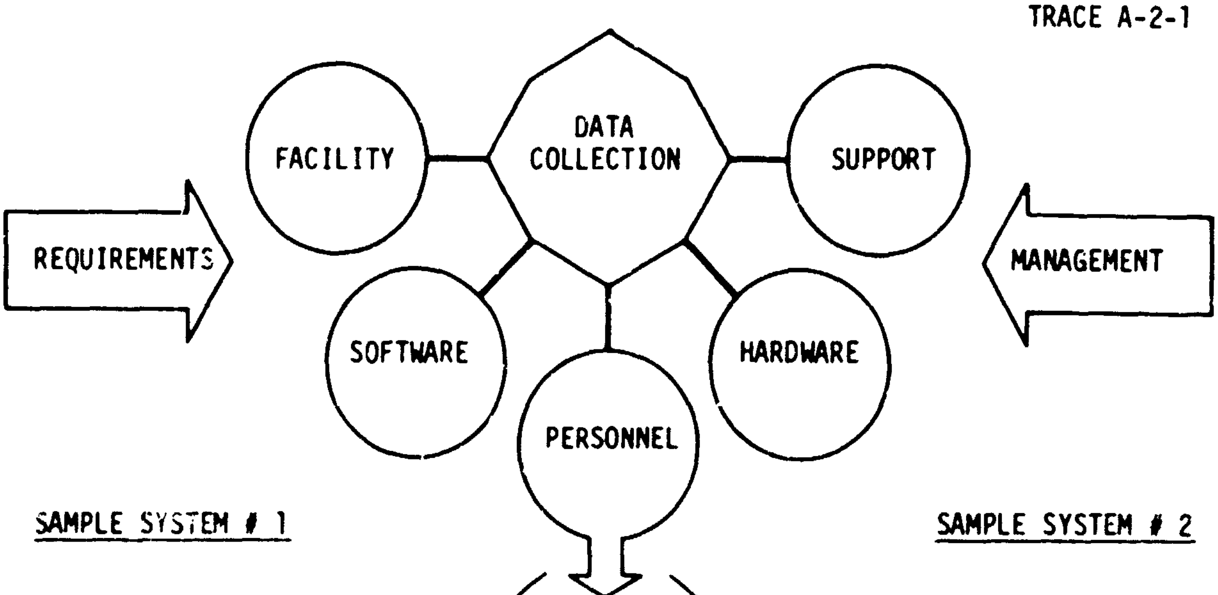
The product is simply an edited display of text that is then sent to digital storage units and in the same digital form in which it was received.

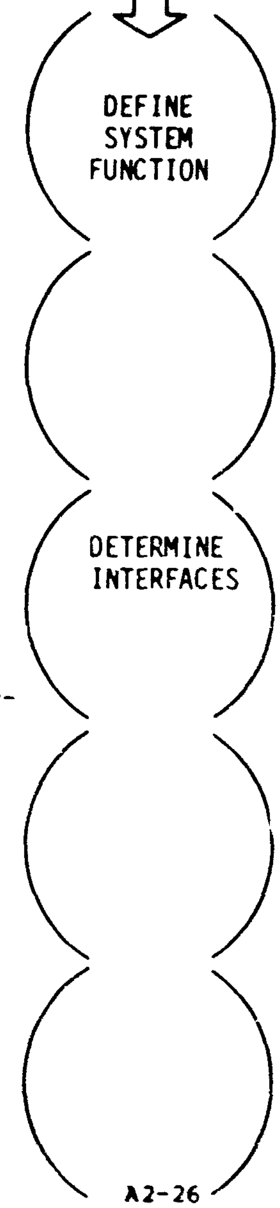
SAMPLE SYSTEM # 2

Other military groups will be coordinating on the mission analysis activity so input and output data must be compatible with these organizations for efficient data exchange through each other's equipments.

A wide range of equipment technology such as cameras, computers, displays, graphic plotters, reproduction equipments, and data storage devices must be reviewed for consideration in this system.

The output products will cover a wide range, from audible communication to hardcopy graphic plots. Equipment to facilitate the production of these products must be listed for further analysis.





SAMPLE SYSTEM # 1

The experience requirements for the personnel will be dictated by the fact that environmental information is being derived from infrared photography and the display station is to be operated in a specified manner.

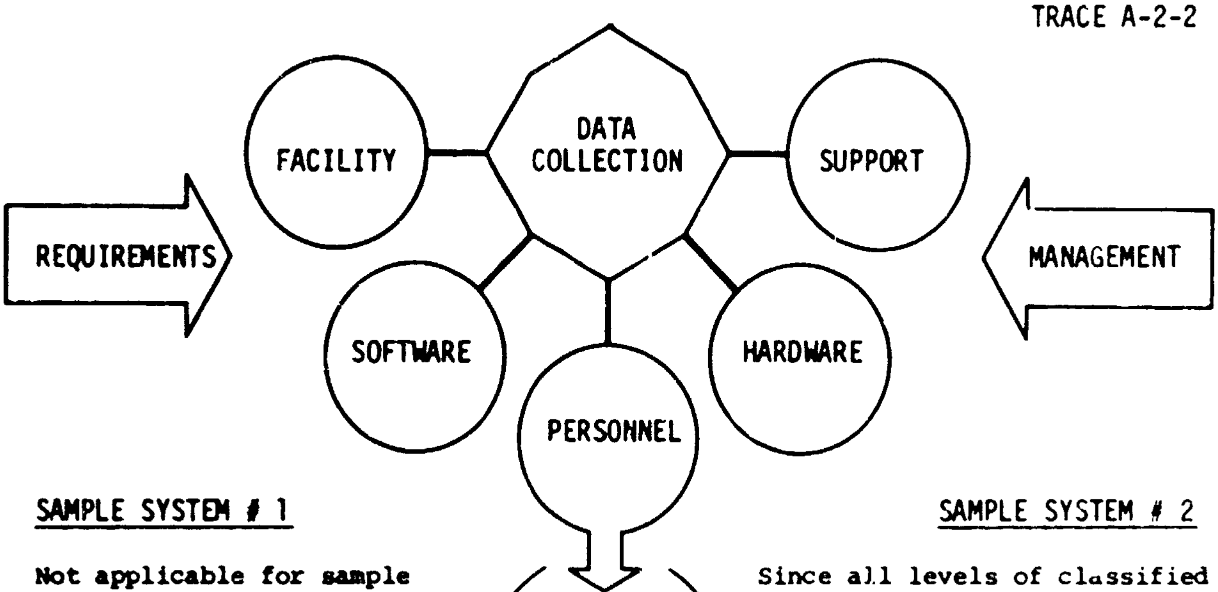
The operator personnel will be working alone most of the time with some interaction necessary with the people performing the initial report composition while extracting data from IR photography.

SAMPLE SYSTEM # 2

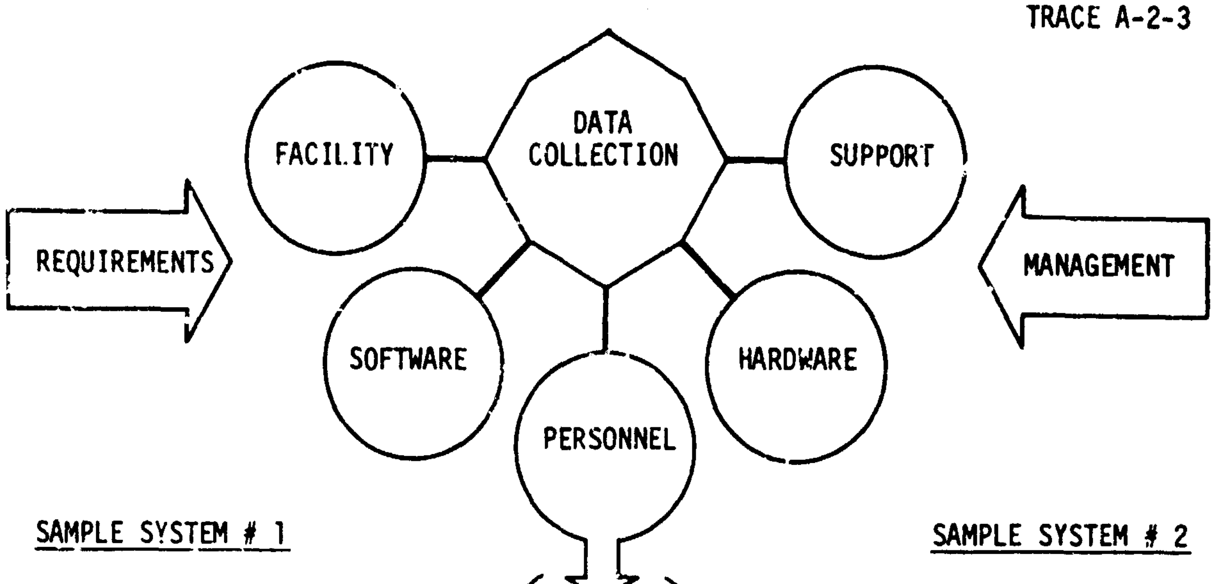
Since many functions are to be performed, the necessity of matching a manning plan to the functions is needed early. Complex training plans will be required as well as will acquisition programs for educated personnel with special skills. In this sample system the support elements will interface directly with the personnel elements in many cases.

Inter-service, intra-service and coordination links to multiple functional areas affecting tactical air mission activities are very important in this sample system, because input data will come from various sources, and products will be coordinated with others outside of this system.

TRACE A-2-2



SAMPLE SYSTEM # 1		SAMPLE SYSTEM # 2
Not applicable for sample system #1.	DETERMINE SECURITY CRITERIA	Since all levels of classified data will be handled coming in, within, and going out of the system the mixture of personnel clearances will affect operating conditions and therefore other system elements.
Since the information is environmental data, a variety of physical earth conditions such as water, soil, plant cover, and topography should be within the experience level of the operator.	DETERMINE DATA TYPES	Personnel experience ranges will be varied and the kind of data to be handled will help identify the manning specifications for skill levels.
This condition only affects the personnel element if it appears that there will be more than one 8-hour shift of activity going on at this display station per day.	DETERMINE DATA VOLUME	Since this will be a continuously operating system with random peaks of activity in different functional areas the manning level will be high. Support elements will be affected by this also.
The most effective personnel assignment planning, secretarial, and administrative interfaces will be identified as a result of this information.	DETERMINE ORGANIZATIONAL LINKS	The possibility of personnel availability under various operating conditions and organizational variations needs to be determined because of the possibility of operation at remote, field locations.



SAMPLE SYSTEM # 1

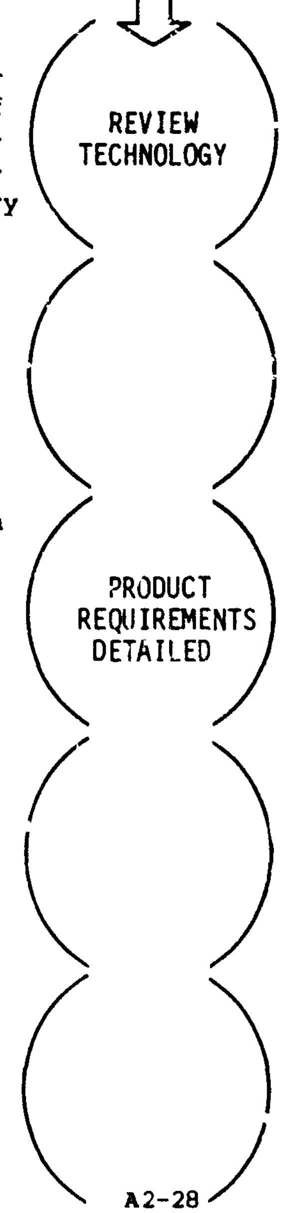
Not applicable to personnel elements, except very indirectly from the standpoint of the amount of people experienced with CRT display operation. Even that is not very significant in this system because the training needs are minor.

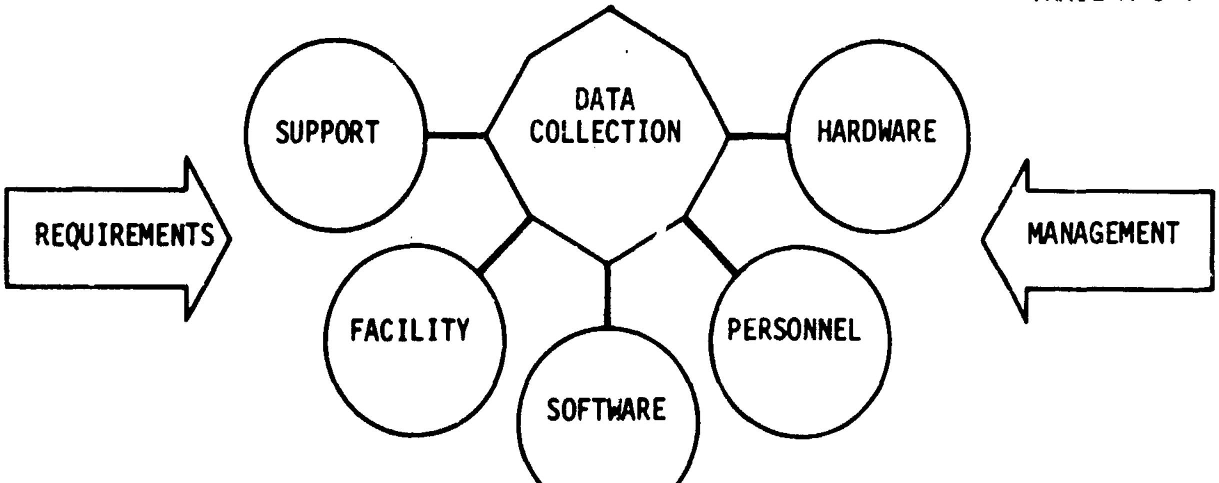
Since the product will be an approved set of information for the environmental data base, the operators are expected to be senior personnel with proper authority and experience.

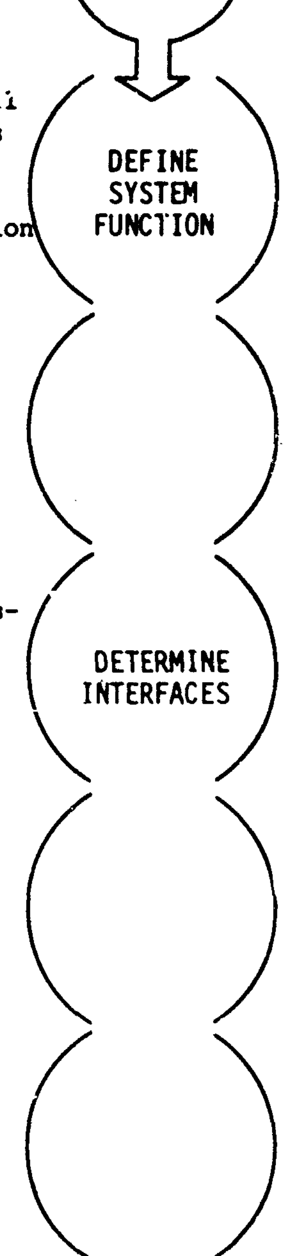
SAMPLE SYSTEM # 2

Since a wide variety of complex equipments will be involved and training will be a significant item, training aids should be initially identified at this point.

Many special graphic, textual, photographic, and digitally formatted products will be produced, requiring personnel with special training and various degrees of competence.







SAMPLE SYSTEM # 1

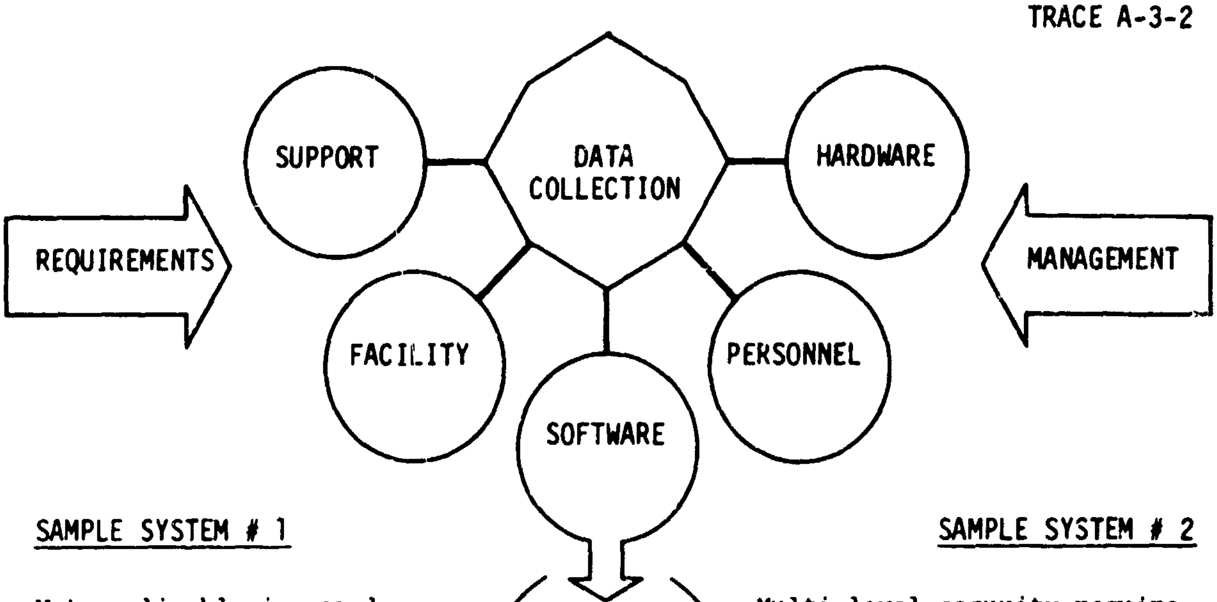
The software needed here will only be application programs for handling the displayed message for storage after editing. Some data conversion routines may be necessary depending on the configuration of the display's data logic relative to the computer and existing software packages.

The data conversion needs from the computer to the display and vice versa require examination.

SAMPLE SYSTEM # 2

All aspects of the software elements will have to be considered based on the many functions to be supported; therefore, the probable need for a large computer support system or multiple computers is indicated in this instance.

Because of many inter- and intra-organizational interfaces, consideration must be given to the programming language and file management system standards. These two features about the computer subsystems with which this planned system must interface need to be determined.



DETERMINE SECURITY CRITERIA

SAMPLE SYSTEM # 1

Not applicable in sample system # 1.

SAMPLE SYSTEM # 2

Multi-level security requirements will affect the software from a file management system standpoint. The clearance levels and location of personnel that will have to operate the system must be collected to determine whether software can assist in this situation.

DETERMINE DATA TYPES

SAMPLE SYSTEM # 1

The data type that is sent from the computer components must be specified as to bit arrangement and electrical characteristics.

SAMPLE SYSTEM # 2

A wide variety of data types dictates the need for many application programs to assist in data conversion and manipulation as the work is performed throughout the operational mission analysis effort.

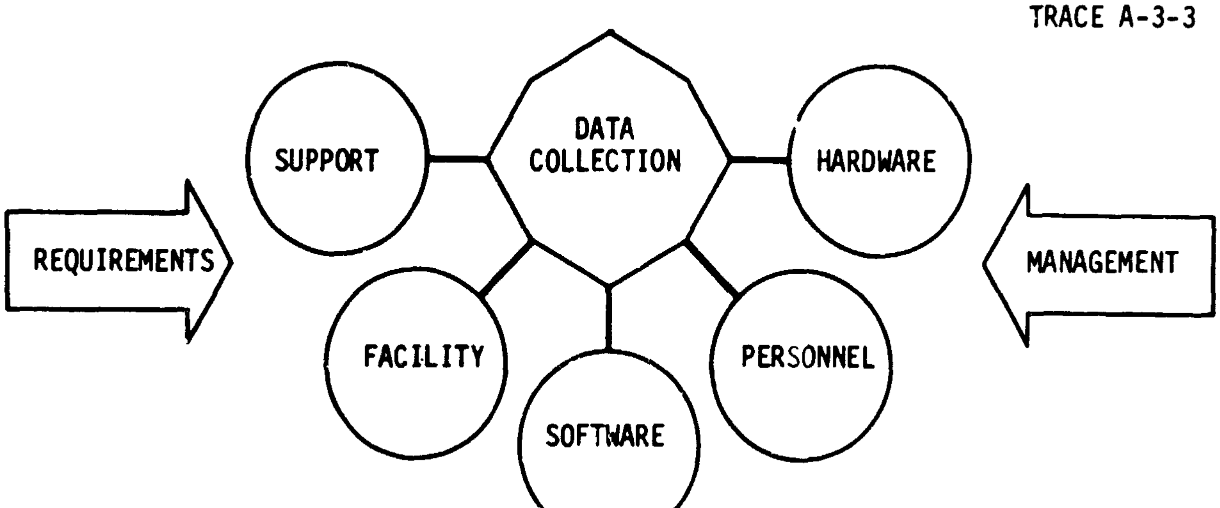
DETERMINE DATA VOLUME

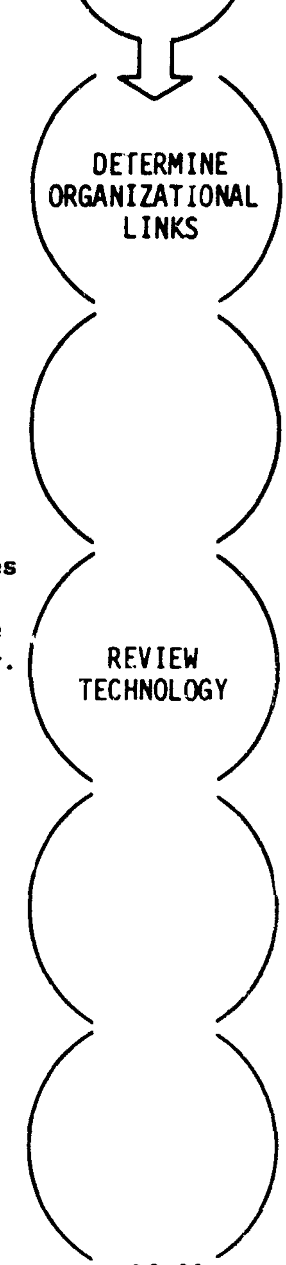
SAMPLE SYSTEM # 1

Volume of data will affect the buffer requirements needed in the display and determine if software is needed to pack and unpack records of information which are used to generate alpha-numerics on the display.

SAMPLE SYSTEM # 2

High volume indicates the need for both on-line and batch processing; therefore, for software to enable background and foreground processing to be accomplished. The amount of data available, when, and at what points in the data flow is very important to be determined at this point.





SAMPLE SYSTEM # 1

Not applicable for sample system # 1.

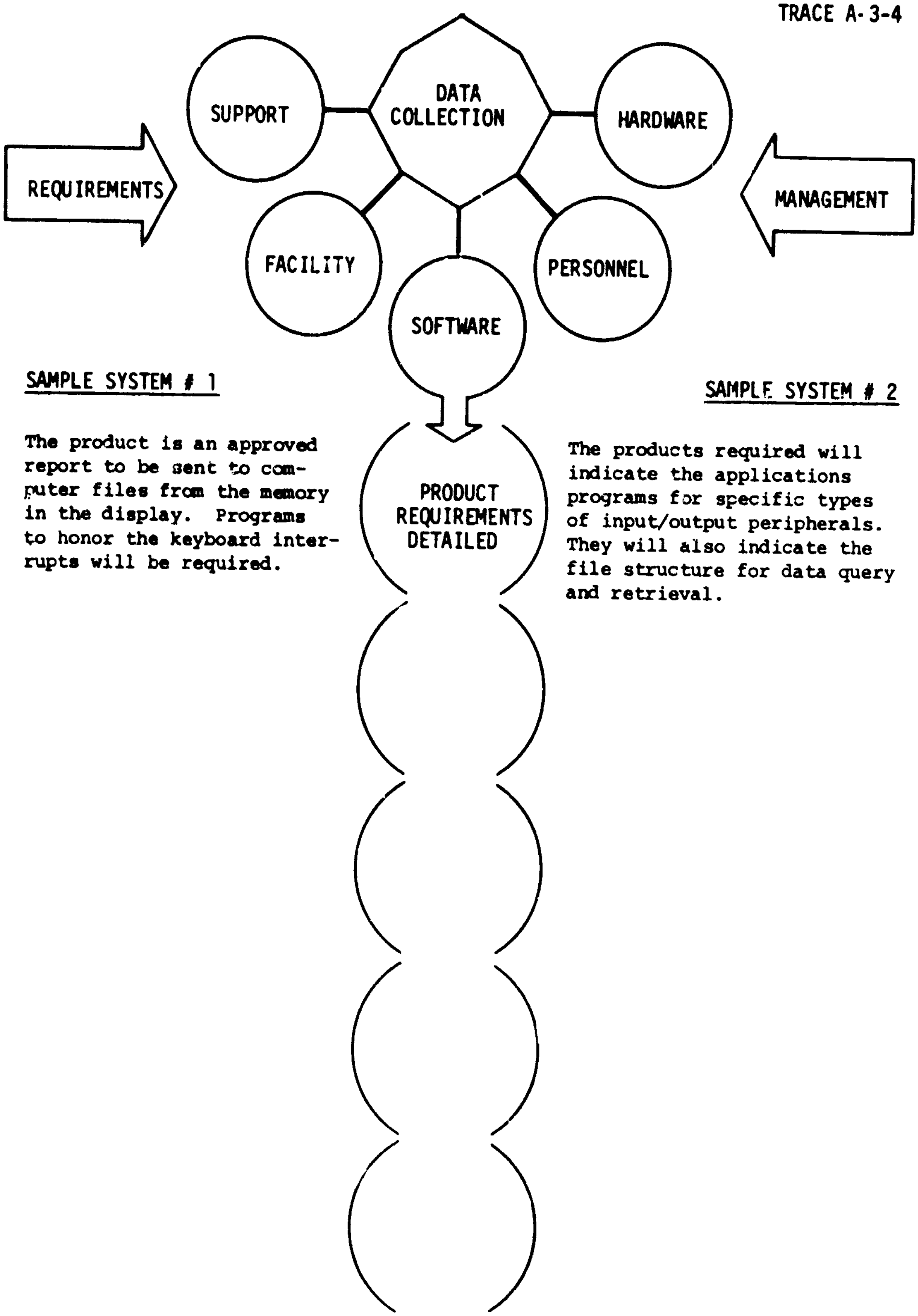
A review of software packages available for the computer being used and the candidate display devices is necessary.

SAMPLE SYSTEM # 2

Tactical mission analysis requires the interaction of many military organizations which may already have extensive software packages available that can help process the data to be used in this instance. They will have to process results of this system's activities and this system should be prepared to accept data from other organizations to be processed.

The status of program languages, application programs for specific input/output devices connected to various central processors, and the operational experience with specific file management systems have to be determined for a large information handling systems such as this.

TRACE A-3-4

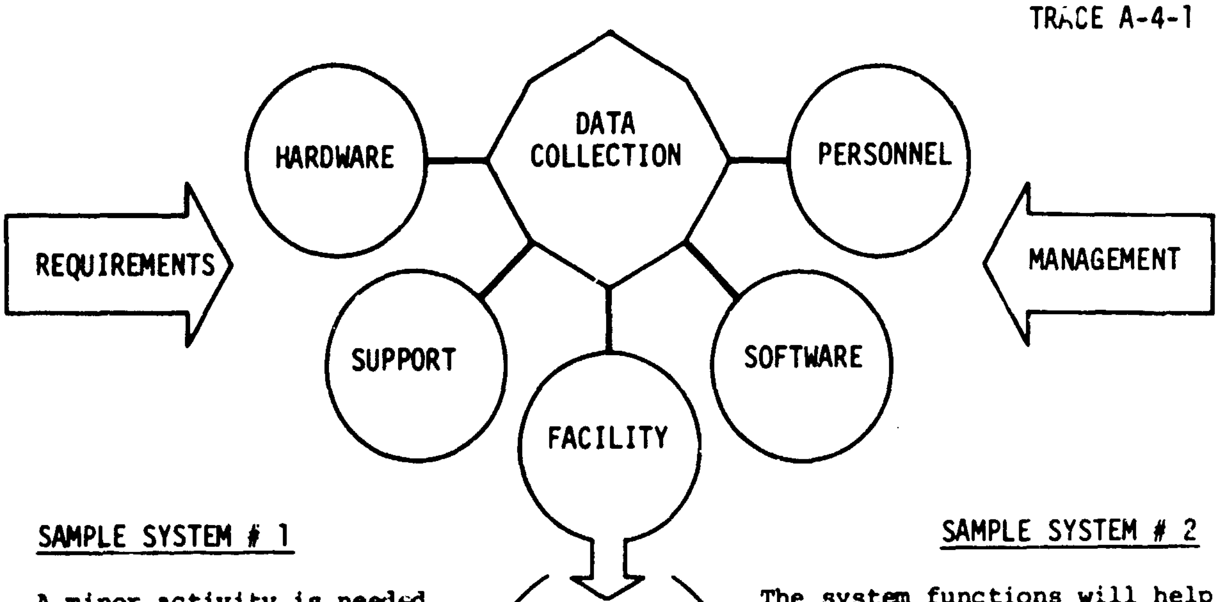


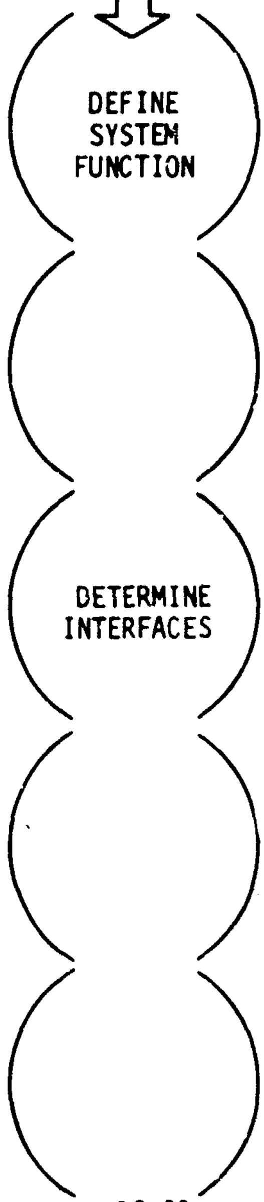
SAMPLE SYSTEM # 1

The product is an approved report to be sent to computer files from the memory in the display. Programs to honor the keyboard interrupts will be required.

SAMPLE SYSTEM # 2

The products required will indicate the applications programs for specific types of input/output peripherals. They will also indicate the file structure for data query and retrieval.





SAMPLE SYSTEM # 1

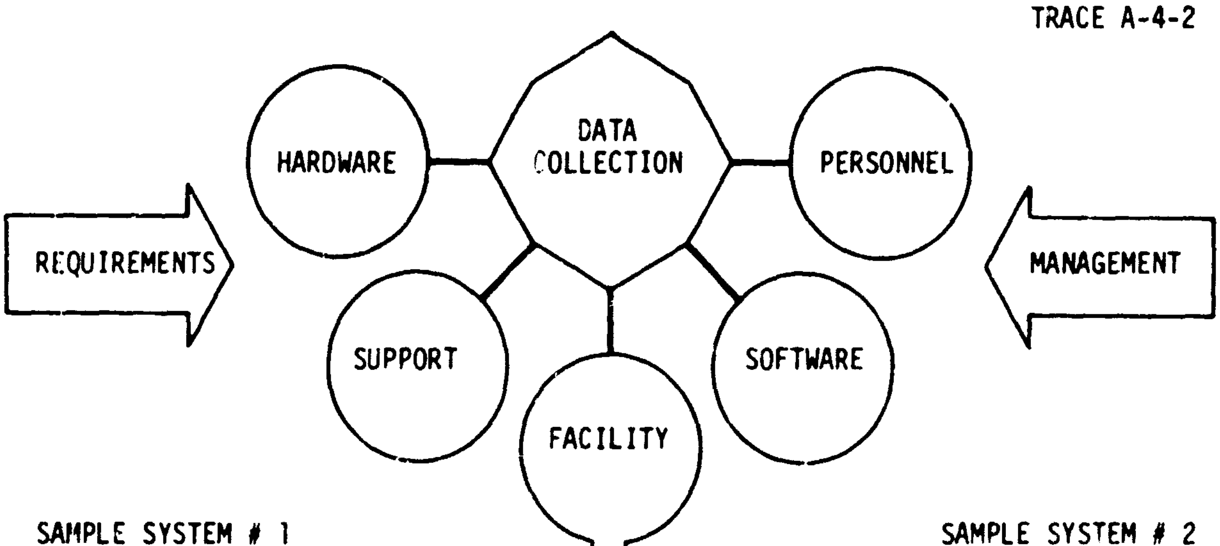
A minor activity is needed to allocate the work station space and assure that electrical interference in the work area will not be so severe as to disrupt the display console's operation. This work station must physically be cable-connected to the computers components.

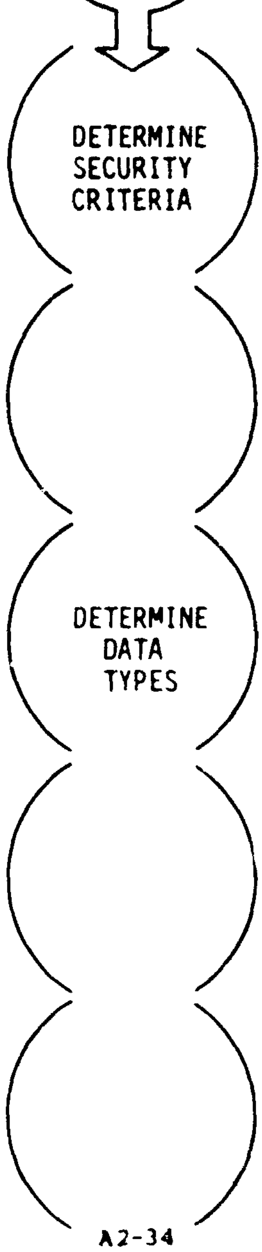
This is needed in order to help determine the most efficient location for the work station.

SAMPLE SYSTEM # 2

The system functions will help define the physical arrangement of internal areas within the facility where the mission analysis operations are to be performed. Multiple structures or separate facilities to perform all the functions may be needed in this case.

The nu[illegible] of personnel needed to in[illegible]e at a high frequency [illegible]ch specific operational data plus functional hardware interfaces may require co-location of this facility with or in existing buildings.





SAMPLE SYSTEM # 1

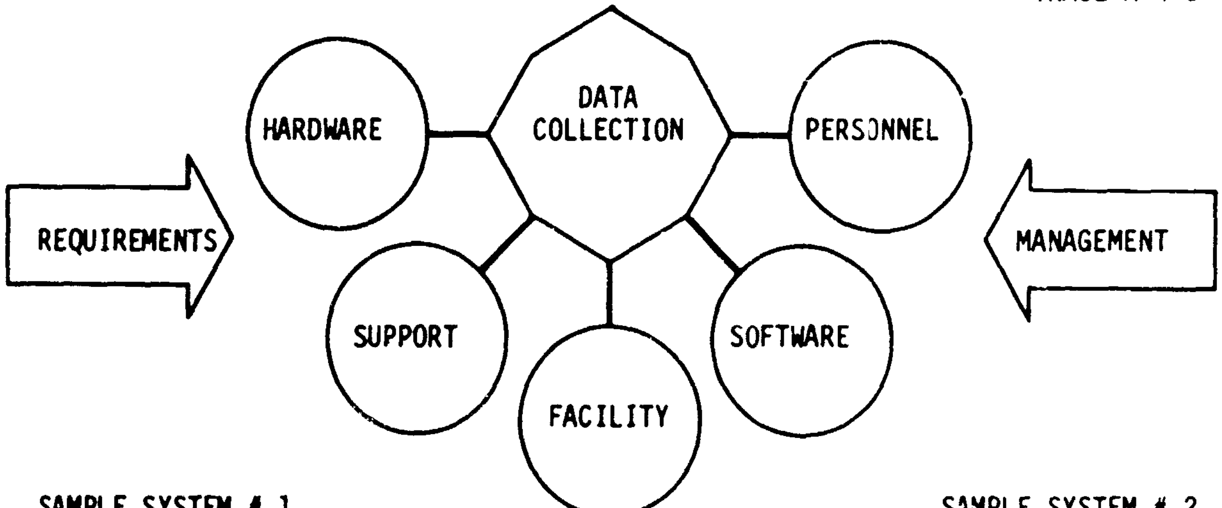
Not applicable in sample system # 1.

Not applicable for sample system # 1.

SAMPLE SYSTEM # 2

Security levels in this instance dictate serious consideration for a secure vaulted facility with special safeguards such as vault doors, shielded rooms, electronic monitors for trespass control, waste disposal systems, etc.

Due to the many types of data formats to be handled in this system there is a need to plan for the physical handling and routing of materials throughout the facility. Courier methods, automatic air tubes, and other methods available for use should be listed.



DETERMINE DATA VOLUME

SAMPLE SYSTEM # 1

Not applicable for sample system # 1.

SAMPLE SYSTEM # 2

The volume of different formats of data will be high, so storage areas will be needed. Environmental controlled areas will be needed also. The amount of data will help determine the number and size of these areas within the facility.

DETERMINE ORGANIZATIONAL LINKS

SAMPLE SYSTEM # 1

Not applicable for sample system # 1.

SAMPLE SYSTEM # 2

The location of the facility will be affected by the organizational connections to this system when it is in operational use.

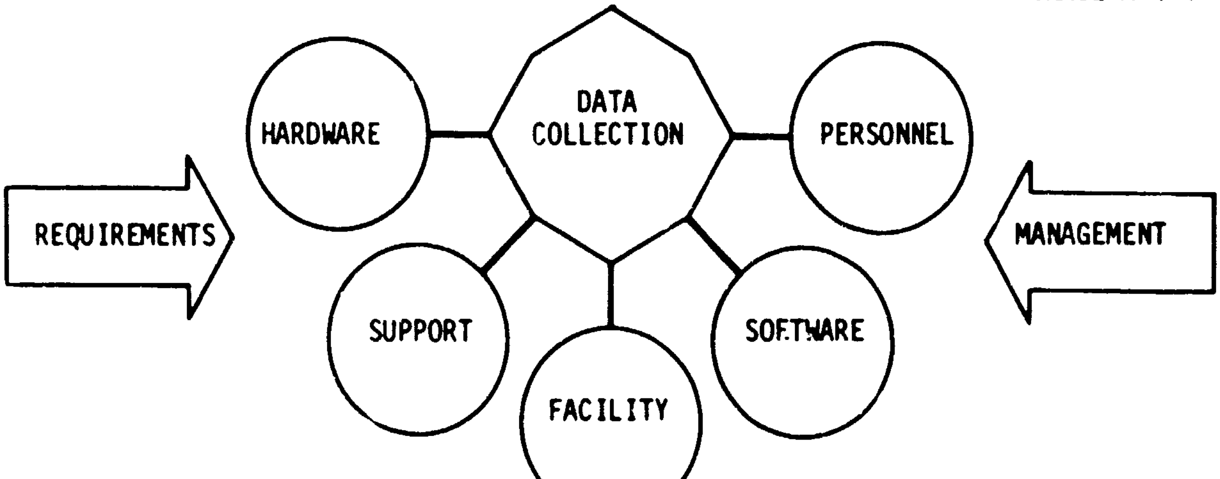
REVIEW TECHNOLOGY

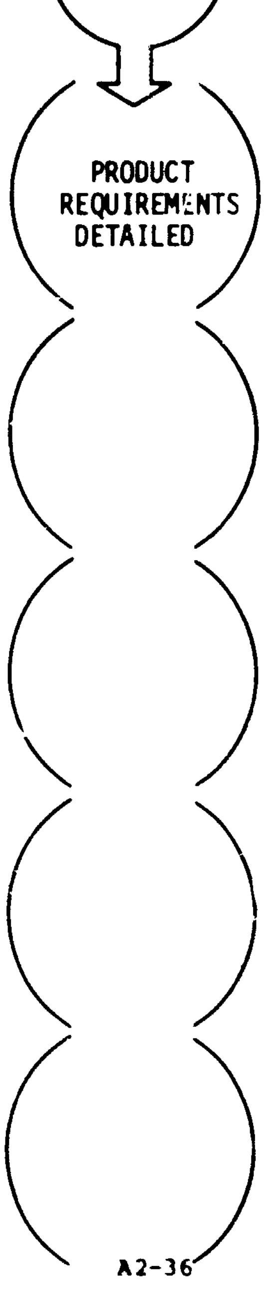
SAMPLE SYSTEM # 1

If some electrical shielding or noise abatement items are necessary, the availability of such items or techniques related to construction should be reviewed.

SAMPLE SYSTEM # 2

Specific features such as shielding, false flooring, security monitoring components, elevators, and automatic routing components should be investigated for this system facility design effort.



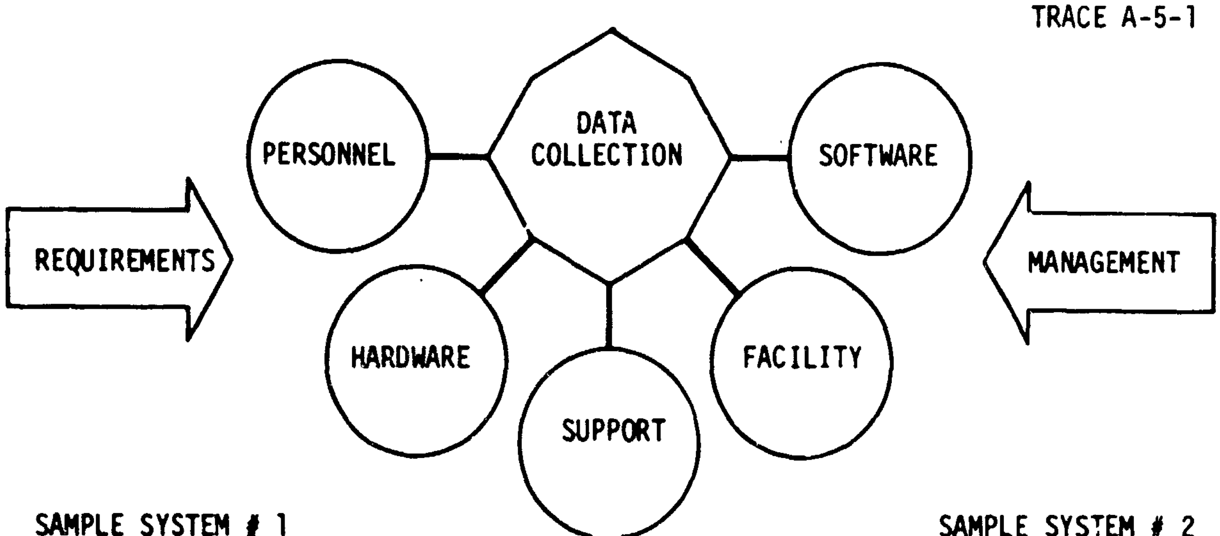


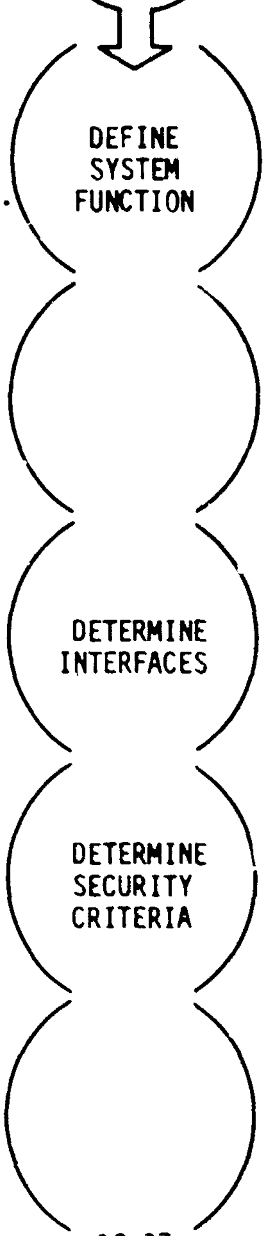
SAMPLE SYSTEM # 1

Not applicable in sample system # 1.

SAMPLE SYSTEM # 2

The products such as photographic materials will result in the need for special rooms for storage and distribution. Digital information to be communicated via autodin or special transmission equipments will require uniquely shielded areas.





SAMPLE SYSTEM # 1

The need for office supplies and items to insure the operator's comfort at the console work station will depend on the functions to be performed.

Not applicable for sample system # 1.

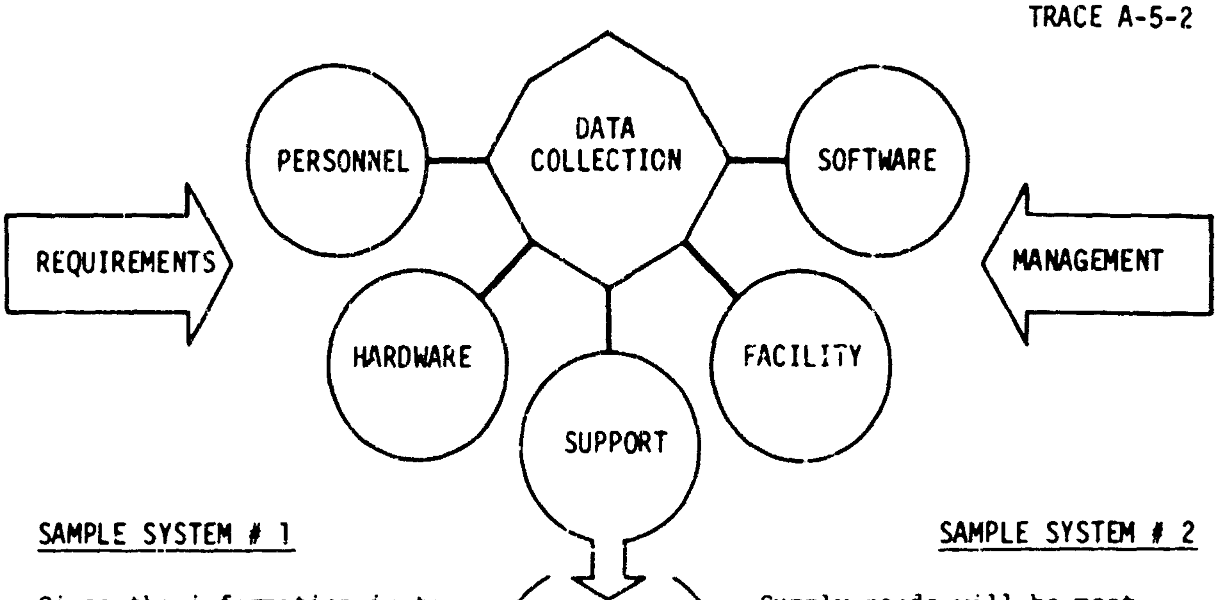
Not applicable for sample system # 1.

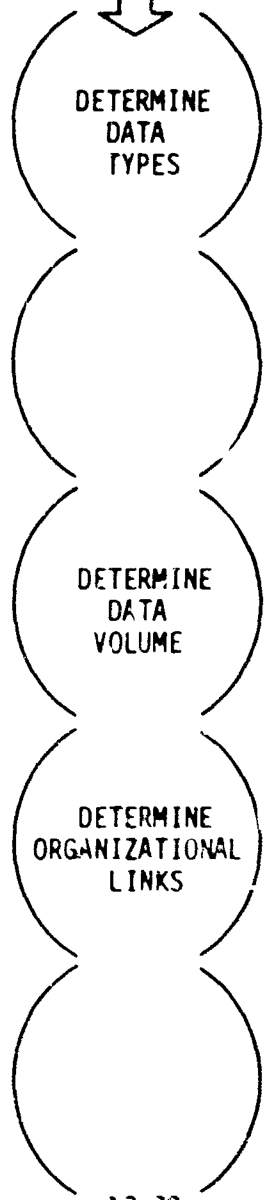
SAMPLE SYSTEM # 2

The many functions need listing to help determine the supply, maintenance, documentation support, personnel housing support, and training support required in developmental and operational stages of this system.

The operational interfaces that require long communication lines or special equipments with highly trained operators will indirectly affect the support needed.

This aspect will affect the support personnel arrangements such as access to equipment for maintenance, the time of day for supplies to be moved, and the clearance problems during training periods.





SAMPLE SYSTEM # 1

Since the information is to be stored in digital form on the computer component, some planning should be initiated relative to what storage media to have available during operation of this system.

Data volume will help determine the number of magnetic tapes, amount of high speed printer paper, and the disk space required which will in turn affect supply activities as related to future operation of this system.

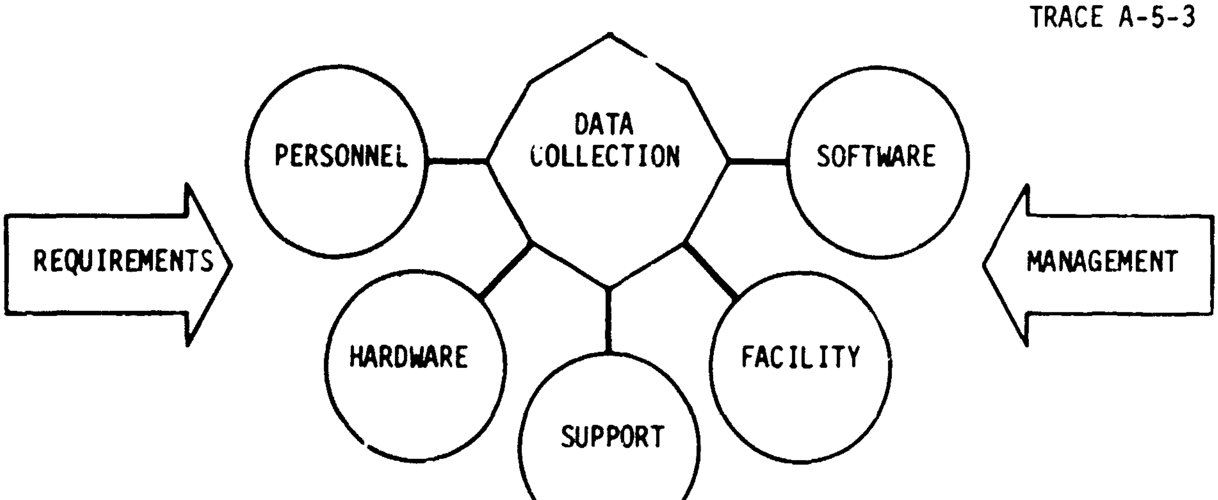
Supply and maintenance support will be required eventually for this system. The organization which performs this support should be identified.

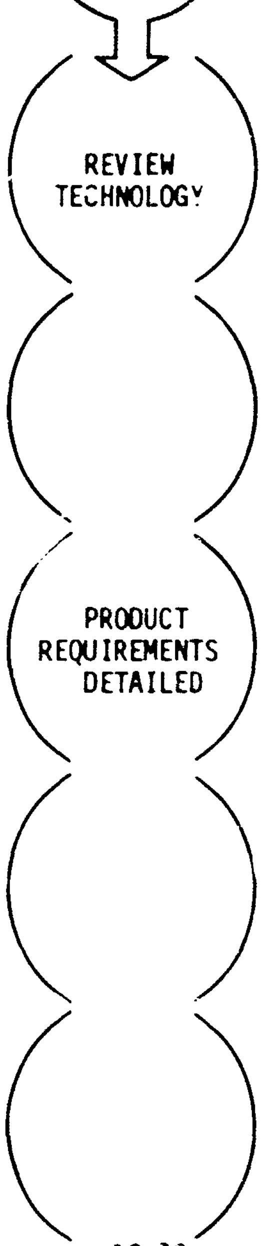
SAMPLE SYSTEM # 2

Supply needs will be most affected by the type of data to be handled. Special materials may be needed as these requirements are identified.

The supply needs will similarly be affected by this factor. Many supply items will be needed in this system, i.e., film, paper, magnetic tapes, special-purpose graphic aids, etc.

The organizational support link will need identification so that supply and procurement channels can be established prior to hardware operation--for testing and production operations.





SAMPLE SYSTEM # 1

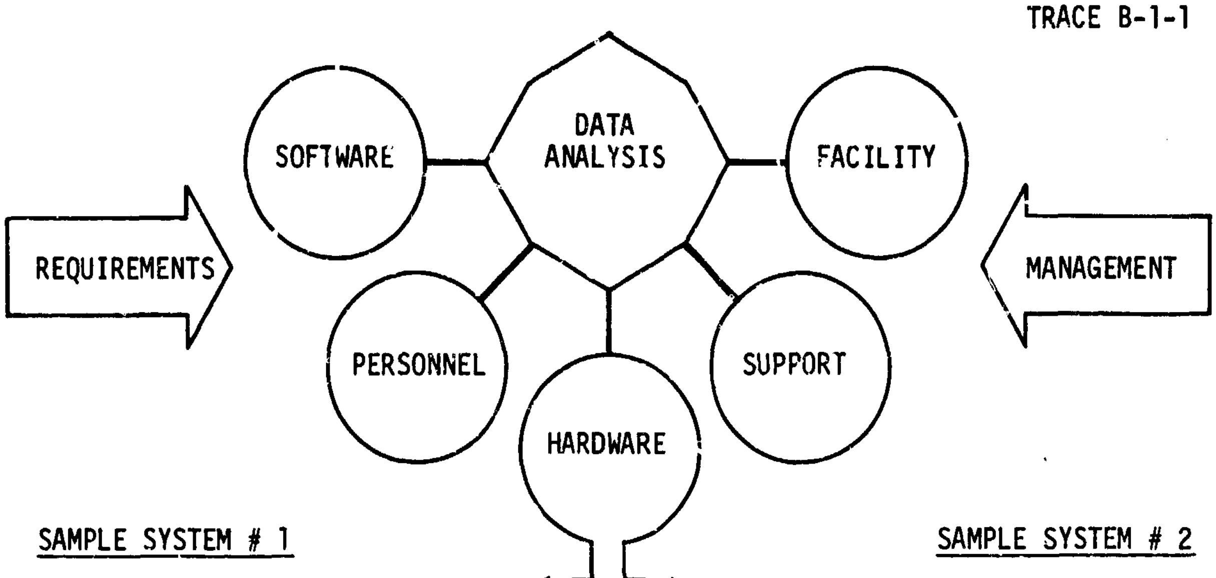
Not applicable in sample system # 1.

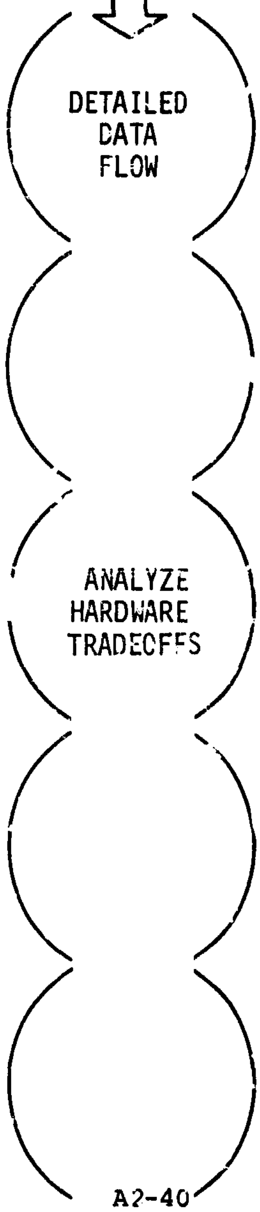
Similar to the result derived by examing the data types and data volume for this sample system.

SAMPLE SYSTEM # 2

This will affect support indirectly by providing data about the reliability and completeness of supply, maintenance, and documentation services available for various elements of the envisioned system.

The product requirements help determine the supply needs which will be considerable in this sample system. The products also indicate the training requirements that will be placed on support commands for operator personnel.





SAMPLE SYSTEM # 1

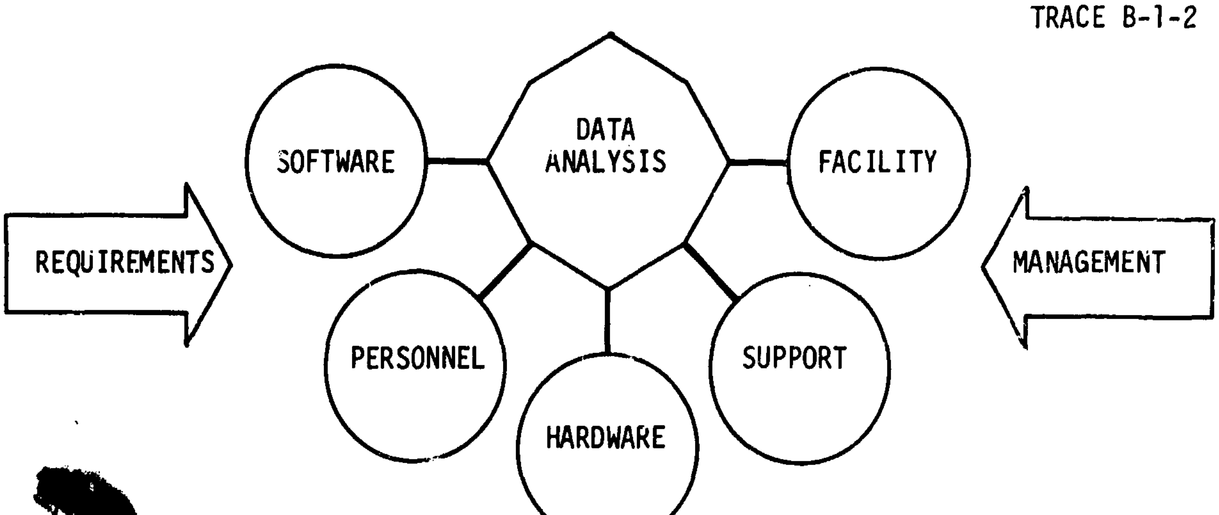
The data flow will be developed for the specific operations or procedures to be performed by the operator at the on-line display console. This will affect keyboard and function keys to be specified later in hardware specifications.

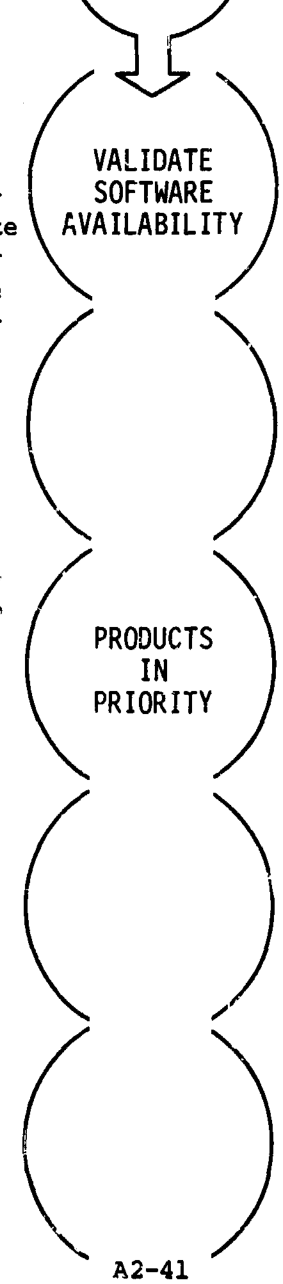
On-line, CRT consoles will be compared and matched against the functional requirements listed from the data collection task. The performance and physical characteristics must be listed and compared.

SAMPLE SYSTEM # 2

This step is extremely important in order to define station identification, alternative hardware configurations plus initial performance, and physical characteristics of the many equipments involved in mission analysis support operations.

Each major category of functional equipment should have a "list of availability" constructed. Then, the performance and physical features of each candidate item should be analyzed by a staff member familiar with the type of hardware elements under evaluation.





SAMPLE SYSTEM # 1

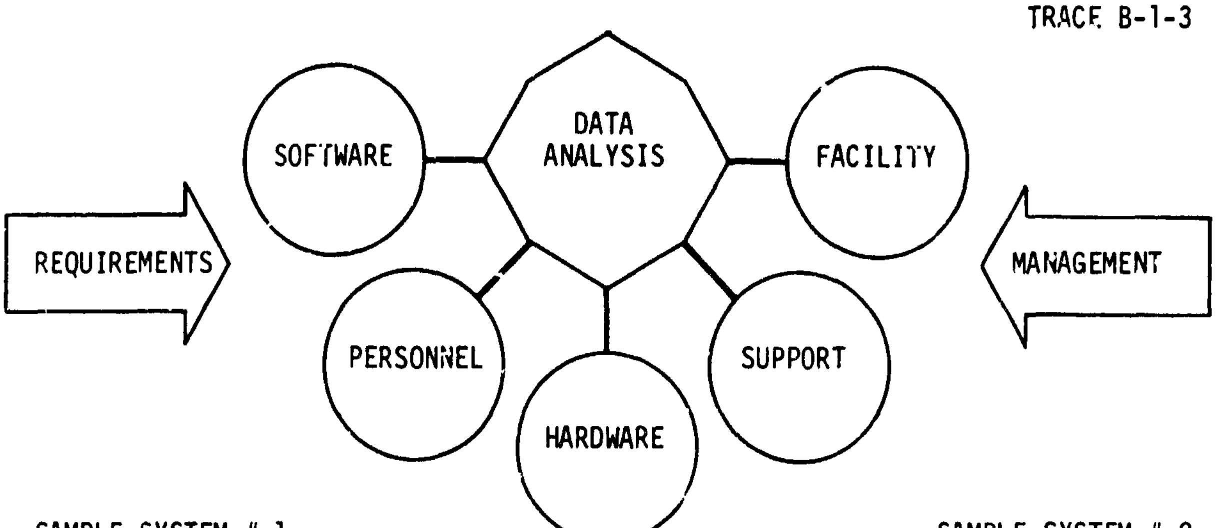
The known software packages for each candidate console configuration connected to the computer should be evaluated. It may be appropriate to write new programs rather than trying to use available packages--unless these packages have been validated as operational with the candidate configurations.

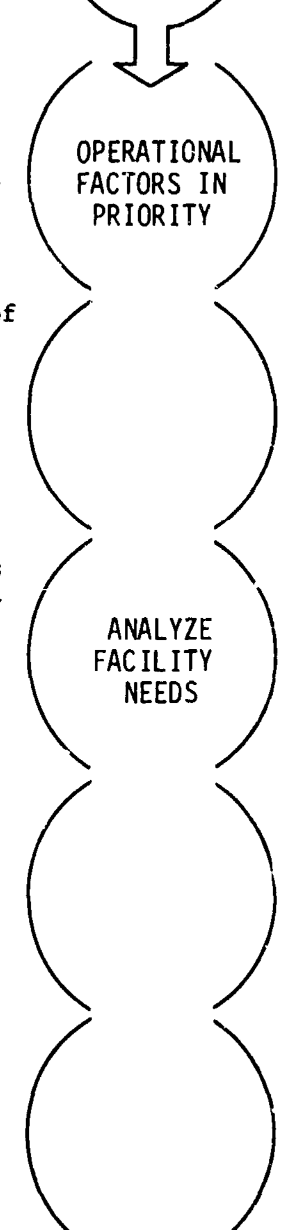
Since there is only one product in this case, this step is of minor importance in this sample system.

SAMPLE SYSTEM # 2

For a large system like this, there is a requirement for a large data processing component. Available program packages on candidate electronic data processing components must be validated as well as identified.

The many products from this system which dictate emphasis on many special purpose input/output equipments must be put in priority so as to help schedule long lead time developments. In some cases this effort helps determine which equipment elements should be procured first with others following as funds, facilities, or other conditions allow.





SAMPLE SYSTEM # 1

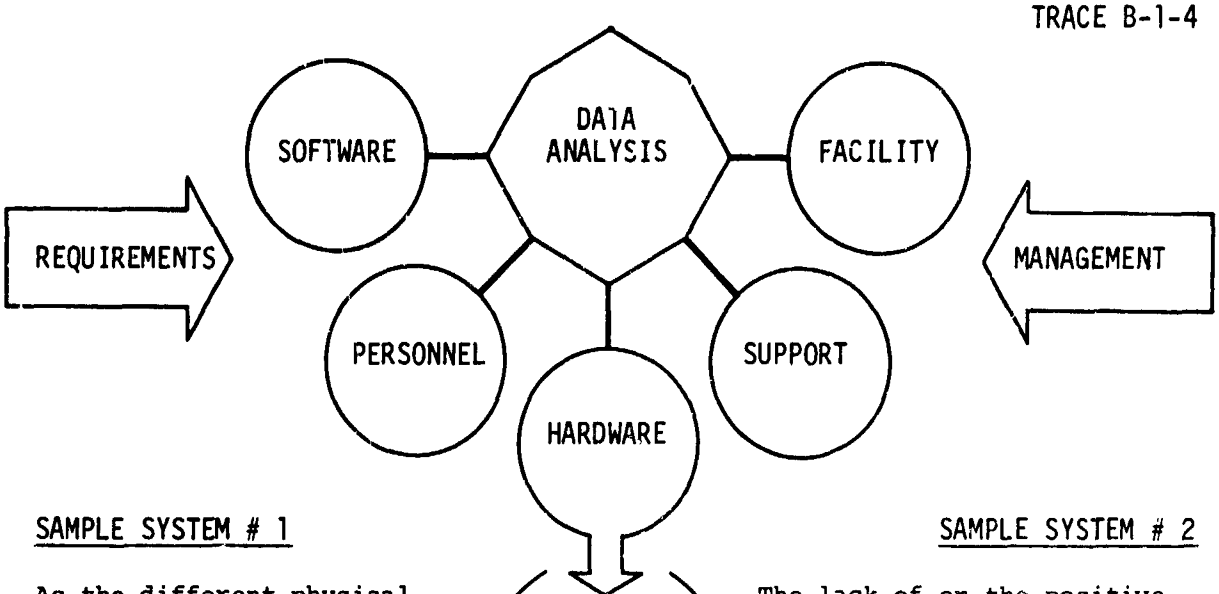
Factors such as the lack of available trained operators, the lack of responsive maintenance, and the probability of continuous operation at periodic intervals may dictate the need for high reliability in component parts of the CRT console portion of the system.

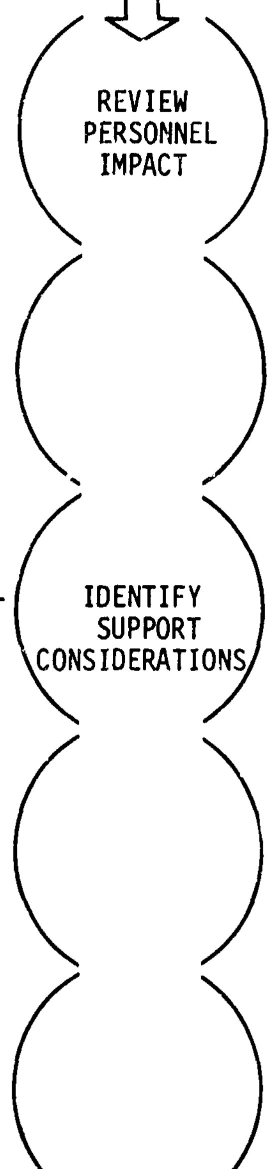
After the available space is specified there is no alternative in this particular sample system. Therefore, this step is a minor activity.

SAMPLE SYSTEM # 2

The need for a <u>responsive</u> capability and a fallback, manual capability at certain times must be placed in priority. This determines the reliability needs, and as probable operational environmental situations are analyzed, the hardware specifications can be tailored to the expected needs.

The tradeoffs in cost and time to modify or build the facility needed to house the equipment must be analyzed. In this case, many adjustments can be made to the hardware elements based on limitations in facility features that can be provided. This is normally an evolutionary step that must be re-evaluated until the baseline system is actually exercised.





SAMPLE SYSTEM # 1

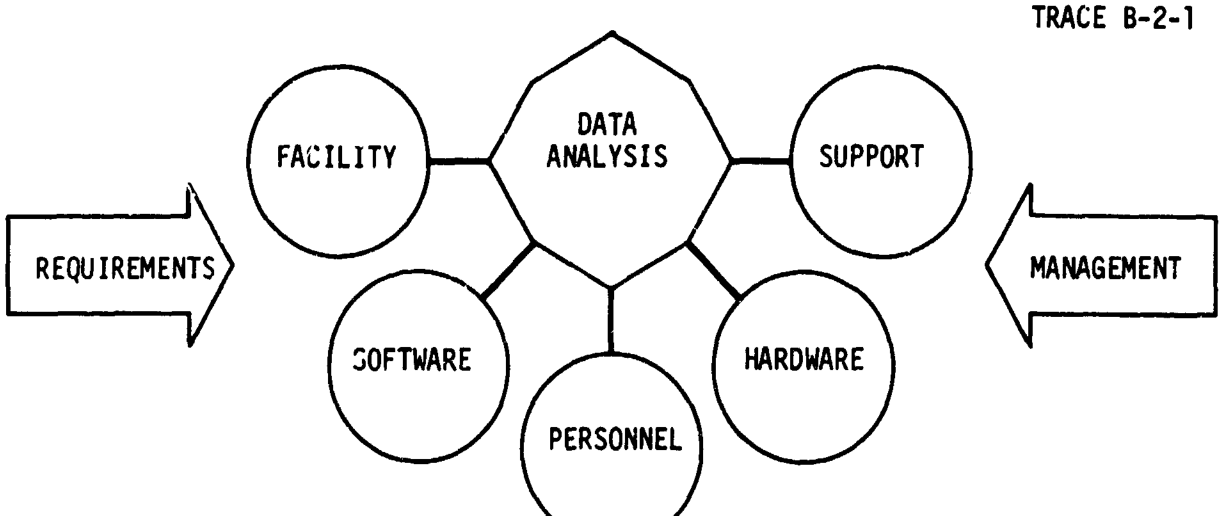
As the different physical characteristics of the display station are analyzed, the training, comfort, and safety aspects of the operator interface must be evaluated for each configuration identified.

As specific station arrangements are considered and equipment reliability and identification data is developed, the supply and maintenance support needs must be compared to the acceptable conditions for support of such an item of hardware.

SAMPLE SYSTEM # 2

The lack of or the positive availability of trained personnel will affect the hardware complexity and number of operator stations planned. Realistic personnel factors must be included at this point. Coordination with the operational command is crucial at this time for this type of system.

The detailed supply and maintenance programs needed to support the various categories of hardware elements should be recorded at this time. Coordination is needed with the user and logistic command organizations at this point. Hardware elements selected will be determined by the manufacturer-provided information about support needed per element.

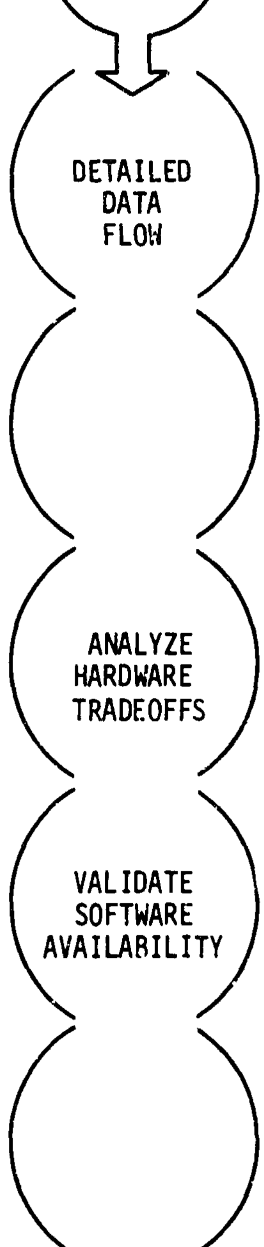


SAMPLE SYSTEM # 1

The data flow will assist in defining the on-the-job training plans to be developed for this sample system.

Personnel training, safety protection items, and numbers of operators to be used will be indicated by the hardware characteristics.

Programming support personnel will be identified as needed dependent on the software available and operational experience per configuration analyzed.

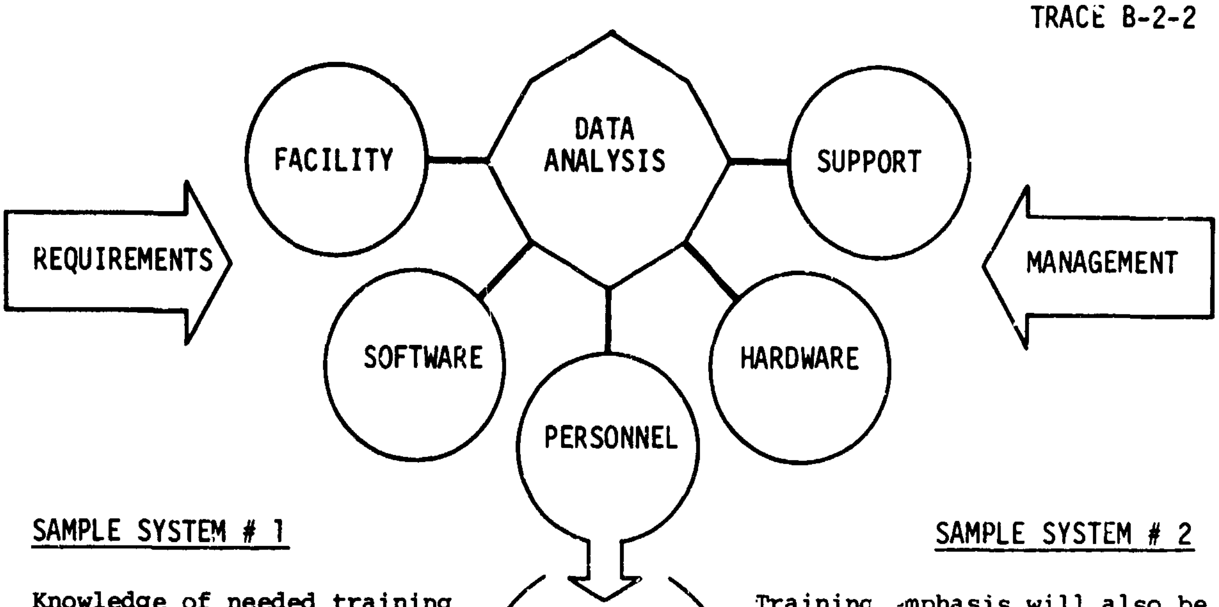


SAMPLE SYSTEM # 2

This step is most important for identifying the number of personnel and their specialties required as the system is implemented. A large system such as this will require unit manning document coordination as far as the using command is concerned.

Specific training methods will be reflected as hardware is determined. Formal, functional training in service schools versus on-the-job instruction will be indicated by the equipment uniqueness and complexity.

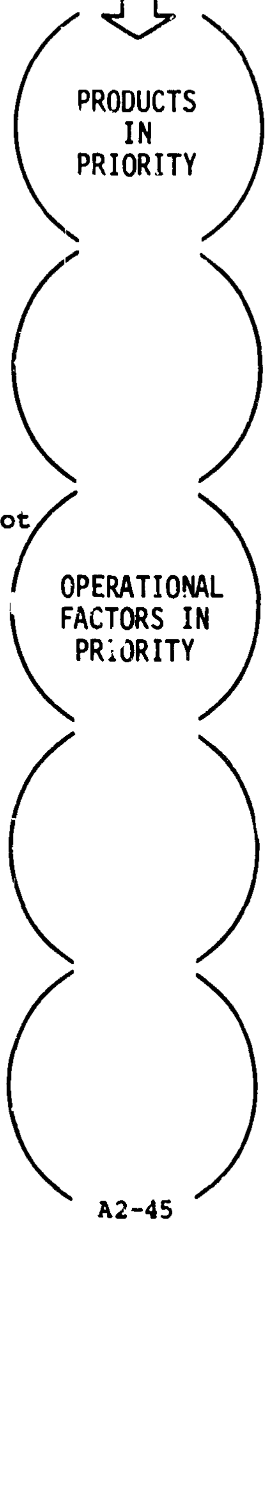
A significant number of on-site programming personnel will be needed to support this system. Also, the implementation will require a staff of software people, and the experience mix of this staff will be dictated by the software implementation routes selected as a result of this analysis.



SAMPLE SYSTEM # 1

Knowledge of needed training emphasis and aids will be facilitated by determining this even though the product is of one type.

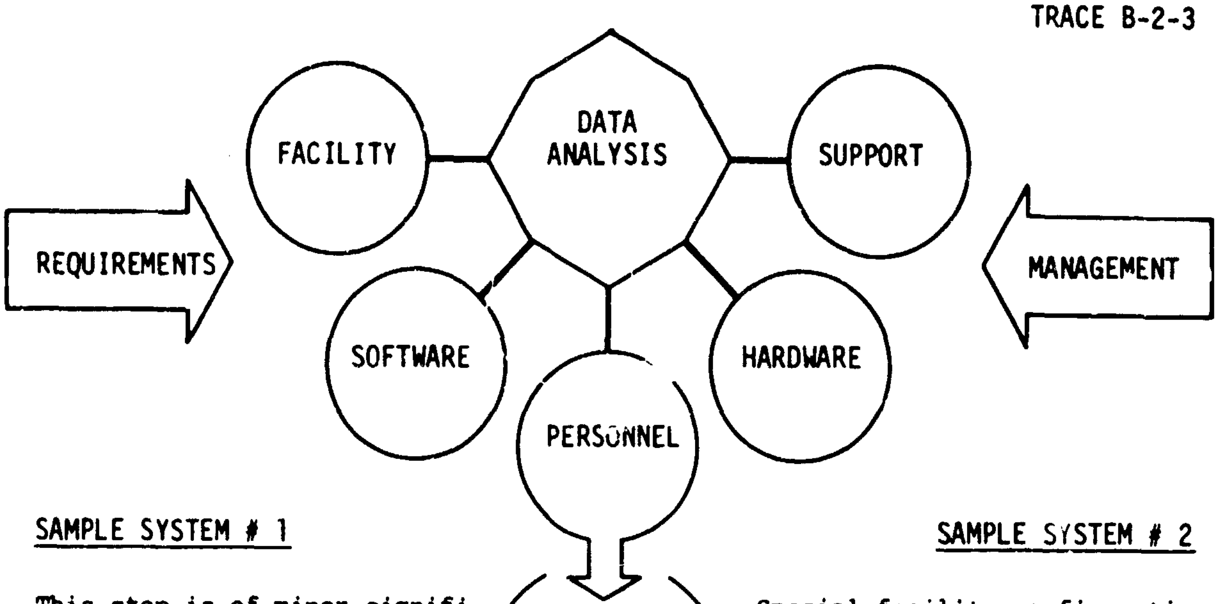
The operating situations do not vary to any great degree in this sample system except as data volume rates change as new reports are generated for approval. On-the-job personnel training will handle this personnel element.



SAMPLE SYSTEM # 2

Training emphasis will also be facilitated in this system; however, the number of products will cause some to be more important than others. The initial products will take precedence over actual training schedules and support materials.

Cross-training personnel with multiple specialties and determining desirable personnel backgrounds for the system operators will be derived from this activity. For instance, in this system, the operational factors dictate that the management personnel will have to be in the military service and experienced in air operations.



ANALYZE FACILITY NEEDS

SAMPLE SYSTEM # 1

This step is of minor significance in sample system # 1.

SAMPLE SYSTEM # 2

Special facility configurations will require personnel standard operational procedures, but no special training is indicated. In some systems where shipboard or aircraft facilities are involved this is a significant factor.

REVIEW PERSONNEL IMPACT

SAMPLE SYSTEM # 1

The number of personnel needed and their availability for other work while operating this system should be considered in light of the organization or overall function being supported.

SAMPLE SYSTEM # 2

The number of needed personnel, availability, length of tour assignment, etc., are factors to consider in such a multi-disciplined system as this during this Data Analysis Task.

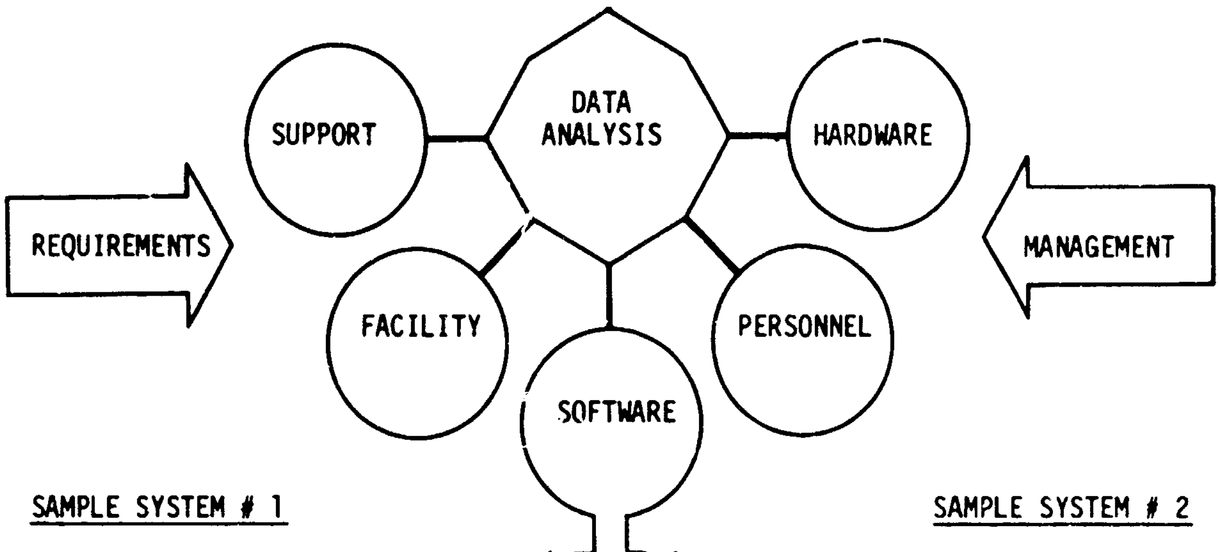
IDENTIFY SUPPORT CONSIDERATIONS

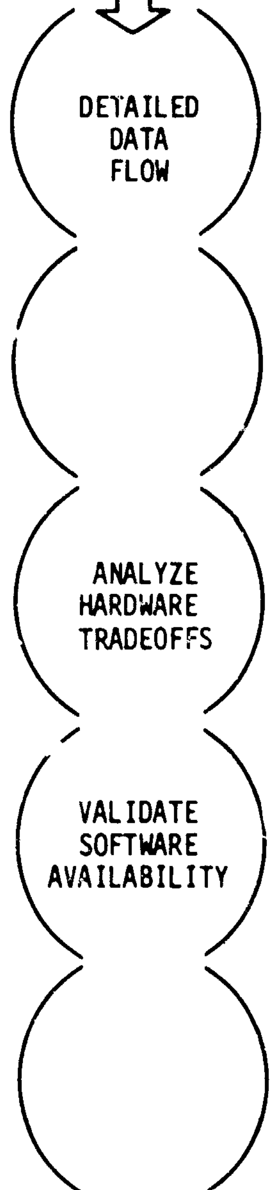
SAMPLE SYSTEM # 1

Training of operating personnel plus any additional supply or maintenance personnel to support the system should be analyzed in connection with the hardware and software elements analyzed during this task of Data Analysis.

SAMPLE SYSTEM # 2

As the number and types of personnel required are analyzed the housekeeping support needed can be identified. In a large system such as this which would operate continuously, but at varying conditions of activity levels, the personnel that must be assigned affects food, housing, medical, and other human support elements.





SAMPLE SYSTEM # 1

The application programs will be identified by analyzing the points where it is a requirement for the operator to retrieve and store digital data.

The hardware analyzed will help list the software available, and as a result, that software which is to be developed.

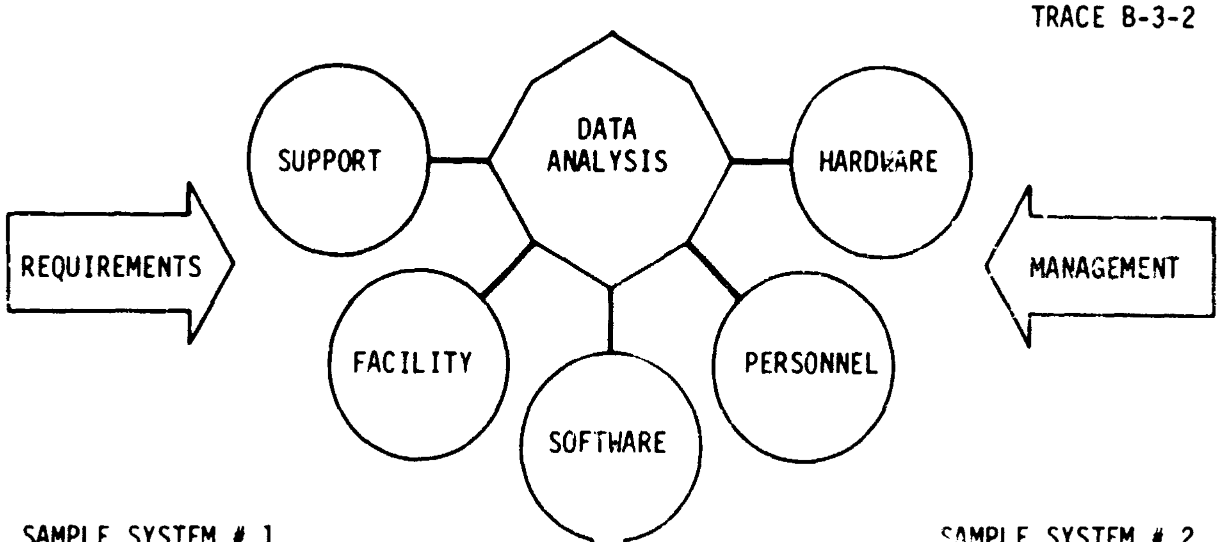
This will identify the method of producing the necessary programs needed as well as simply identify the programs related to the function to be performed.

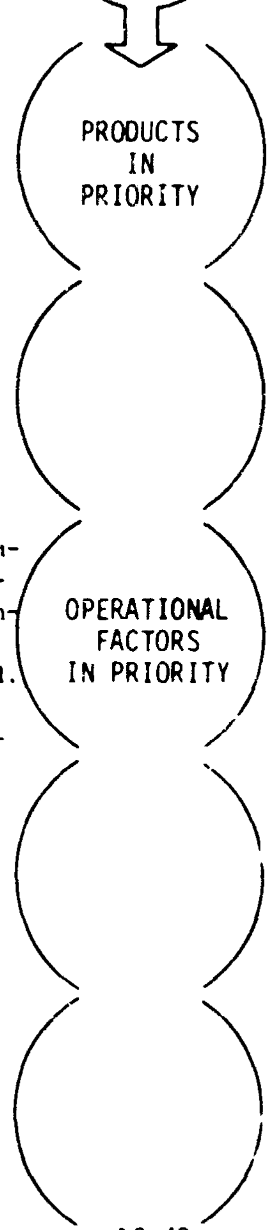
SAMPLE SYSTEM # 2

An analysis of the data flow will identify the many application programs needed to support on-line display stations, and will provide a basis for tradeoff decisions about automating certain procedures or performing them manually. Special station-oriented data flow procedures will indicate the file organization of data to be used at these stations which support mission analysis functions.

As specific hardware is analyzed and ranked in order of suitability, the software elements needed to compliment the hardware devices can be identified.

In a large system such as this, the availability of programs to support various operations must be investigated. Since many functions are to be done in this system for the first time with on-line computer support, there will be a need for a large amount of original programming. Any useful, available, well documented conversion packages will help to reduce the software effort in a large system like this.





SAMPLE SYSTEM # 1

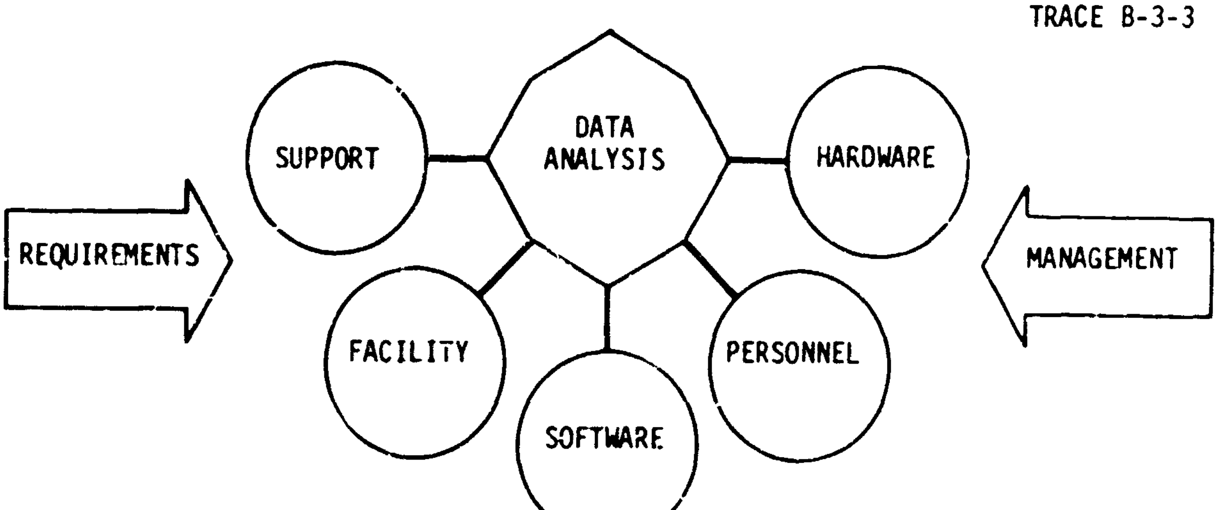
This step is not applicable in this sample system since there is only one product.

The possible change of the computer system within the organization where this on-line console application will be implemented should be analyzed. This would affect possible software modifications or program languages used here.

SAMPLE SYSTEM # 2

This step must be done in order to schedule the programming effort so that the system software is available as needed, and the important product generation work is supported first. Increased capability is added as time and money allow.

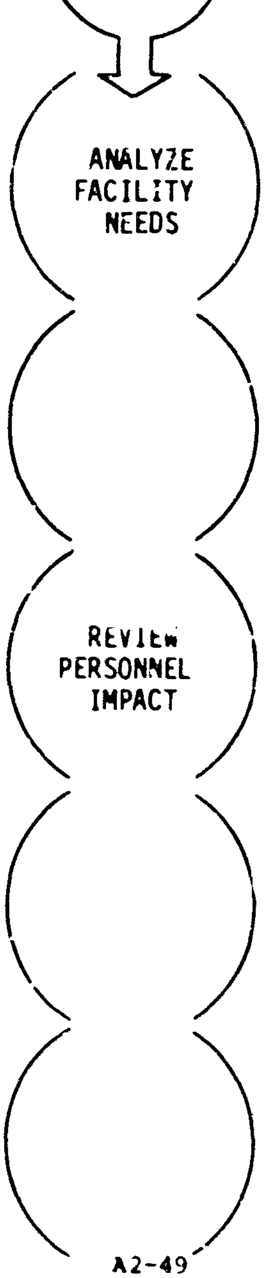
The on-site programming requirements for contractor or military personnel will be affected by this. The amount of changes anticipated to software over a given period of time must be analyzed in light of the operational mission analysis operation. It may require that all software work be demonstrated fully before introducing into the operational situation.



SAMPLE SYSTEM # 1

Not applicable for sample system # 1.

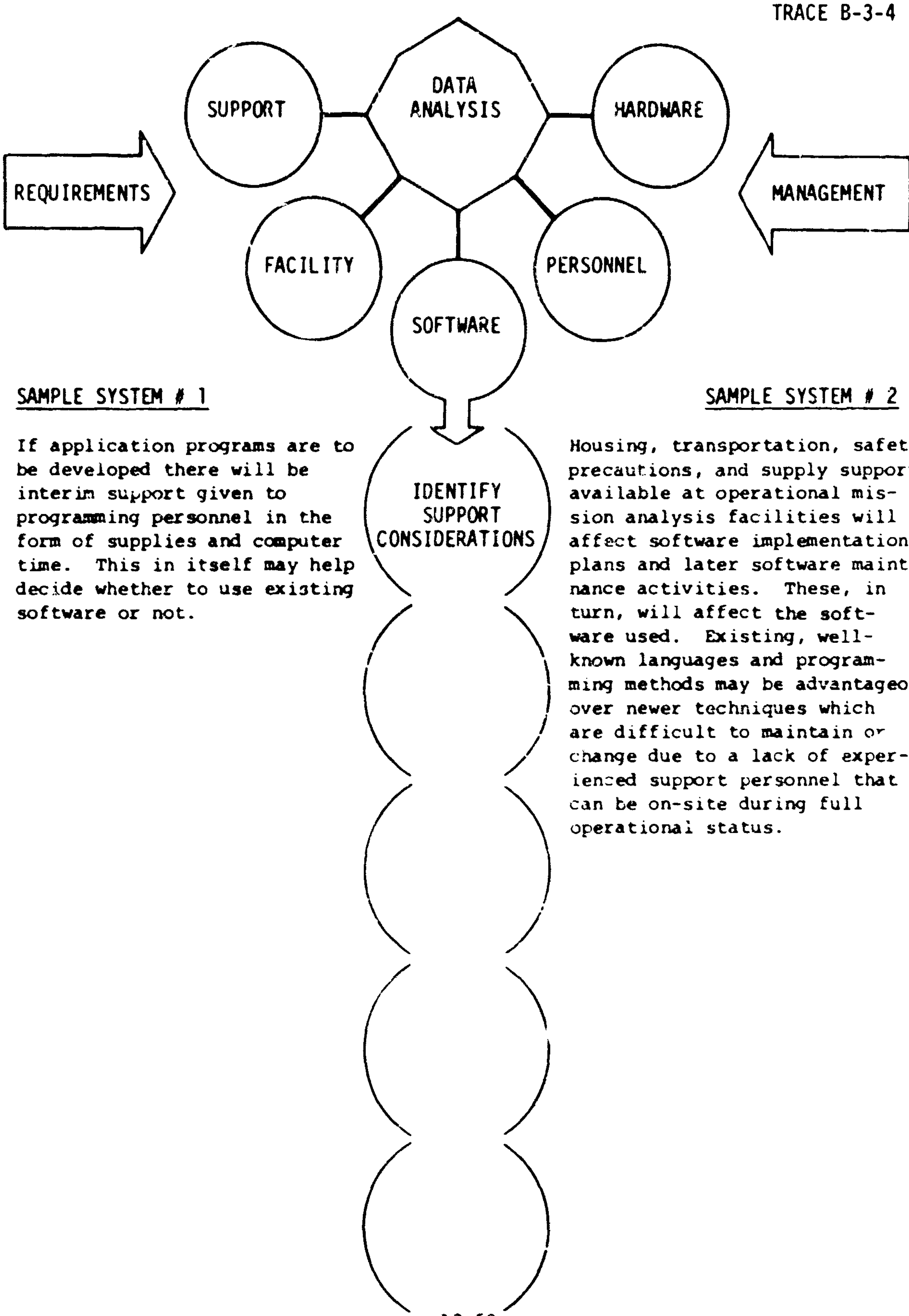
If programming personnel are needed to implement and maintain the operational software, there will be an impact on the personnel element for this sample system.



SAMPLE SYSTEM # 2

The greatest impact on the software elements will be whether the programming can be done at the operational site or performed remotely and transferred into the operational system after checkout.

The programming language and connected educational materials will be affected by the availability of trained personnel. If only military personnel must be used in the future due to considerations such as security, cost, etc., then immediate and long-term software plans will be affected by the level of software experience within the Air Force.

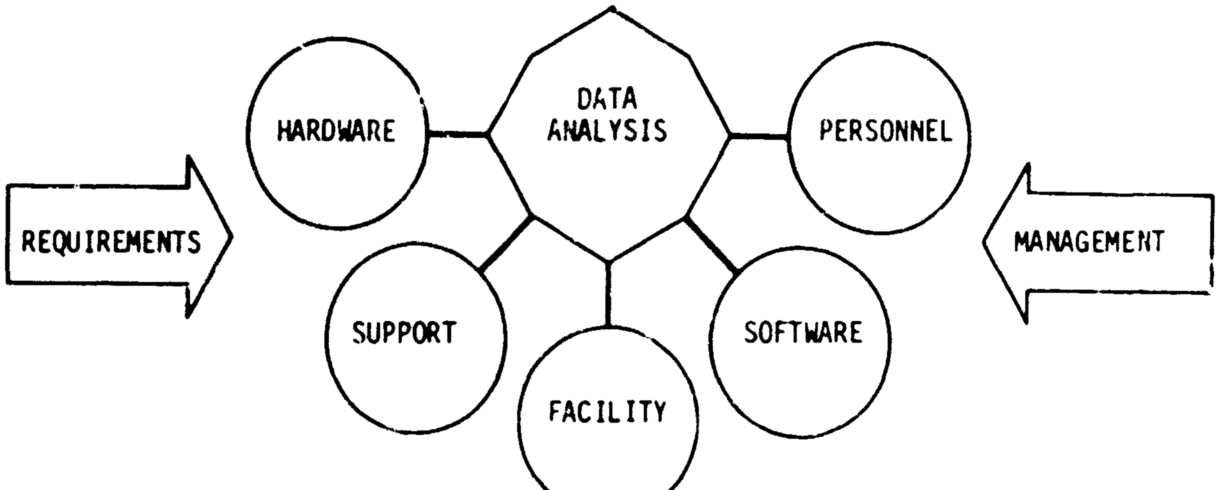


SAMPLE SYSTEM # 1

If application programs are to be developed there will be interim support given to programming personnel in the form of supplies and computer time. This in itself may help decide whether to use existing software or not.

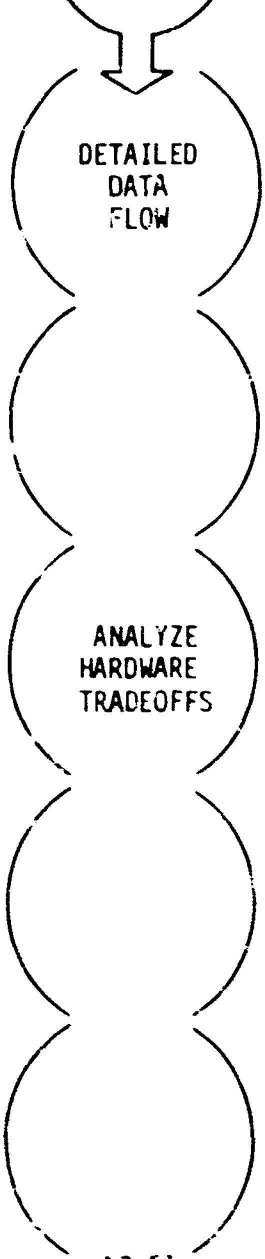
SAMPLE SYSTEM # 2

Housing, transportation, safety precautions, and supply support available at operational mission analysis facilities will affect software implementation plans and later software maintenance activities. These, in turn, will affect the software used. Existing, well-known languages and programming methods may be advantageous over newer techniques which are difficult to maintain or change due to a lack of experienced support personnel that can be on-site during full operational status.



SAMPLE SYSTEM # 1

SAMPLE SYSTEM # 2

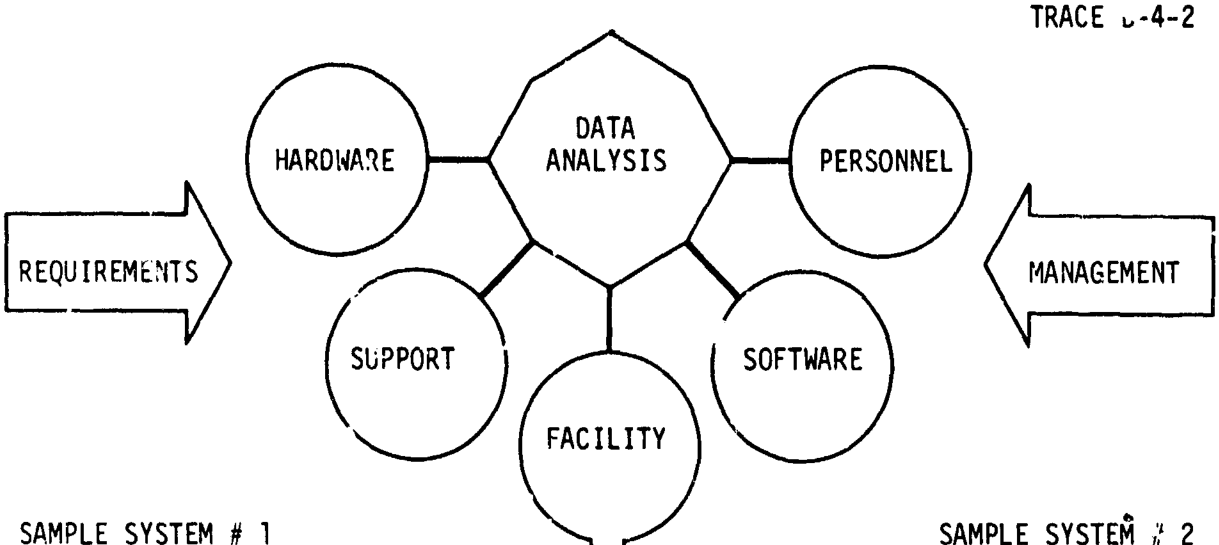


Not applicable in sample system # 1.

This is very significant in order to properly plan the internal facility layout. The method of receiving input data and shipping hardcopy products between work areas will be identified by analyzing the data flow. Facility drawings and cost estimates can only begin after this step has been performed for a large system.

Electrical shielding needs, noise control, and the hardware's physical characteristics will possibly affect floor modifications, type of wall paneling, or minor cable routing plans in this system.

The entrance doors, false floors, cable ducts, room sizes, shielding, etc., will be varied between areas within the facility housing the tactical mission analysis system. The hardware selected will help determine these variations.



SAMPLE SYSTEM # 1

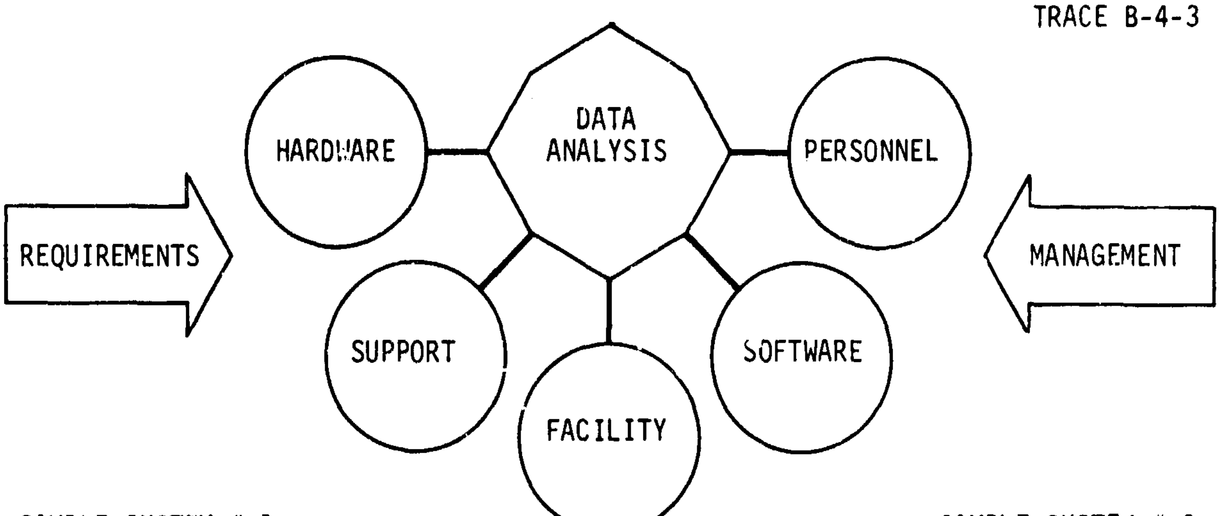
Not applicable for sample system # 1.

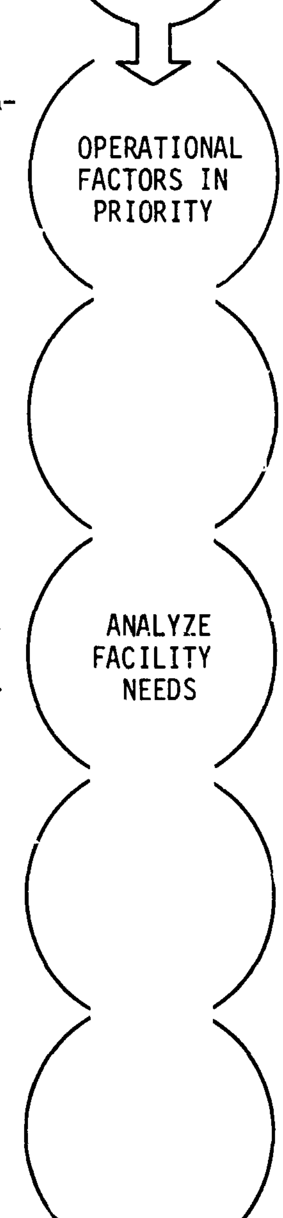
Not applicable for sample system # 1.

SAMPLE SYSTEM # 2

Space allocated for on-site software support personnel for certain periods of time should be estimated as a result of this analysis. Facility elements will be affected as a consequence of using or not using available software. Work space, rest rooms, uncleared access areas, etc., will be the elements to consider.

A minor effect caused by product priority is reflected in the design of rapid shipping and receiving areas within such a facility. Cabling ducts and environmental control systems will have high priority if certain products are most important and require such facility items.





SAMPLE SYSTEM # 1

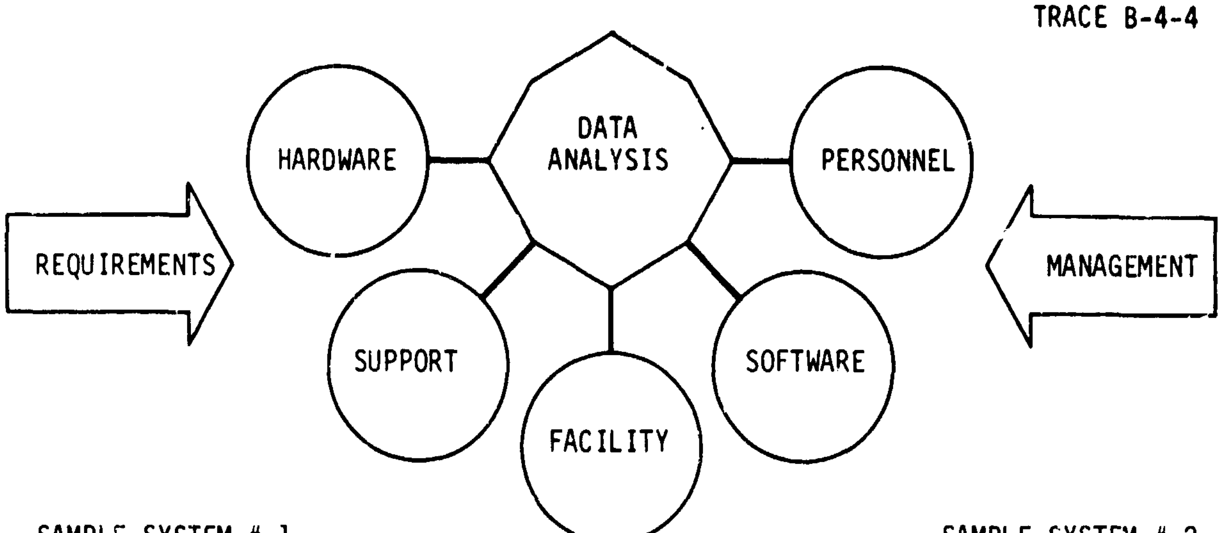
The overall operating environment factors inherent in the facility to be used may require modifications to the room where the display work station is to be located. Many people moving about for instance, could indicate a need for sound proofing or special partitions to reduce ambient light.

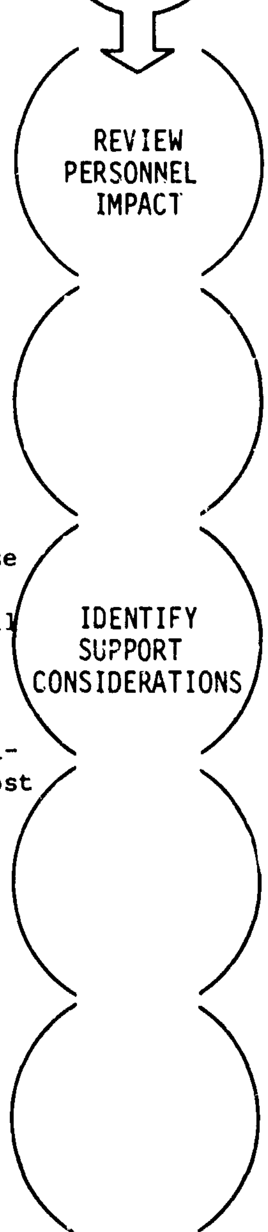
This is directly applicable and sums up all factors that will affect the facility elements. At this point, time and cost factors for facility work should be identified.

SAMPLE SYSTEM # 2

Climatic conditions, the military combat situation, mobility requirements, and security needs all affect the facility elements for such a system. If the mission analysis is to be conducted in movable shelters in support of a deployable wing of aircraft, the facility elements would be much different then at a fixed base of operation where permanent buildings can be used.

This is directly applicable and sums up all factors that will affect the facility elements. At this point, time and cost factors for facility preparation will be identified. In a large system such as this, the facility data may have to be analyzed by distinct functional areas if there are separate work areas allocated within the initial overall facility plans.





SAMPLE SYSTEM # 1

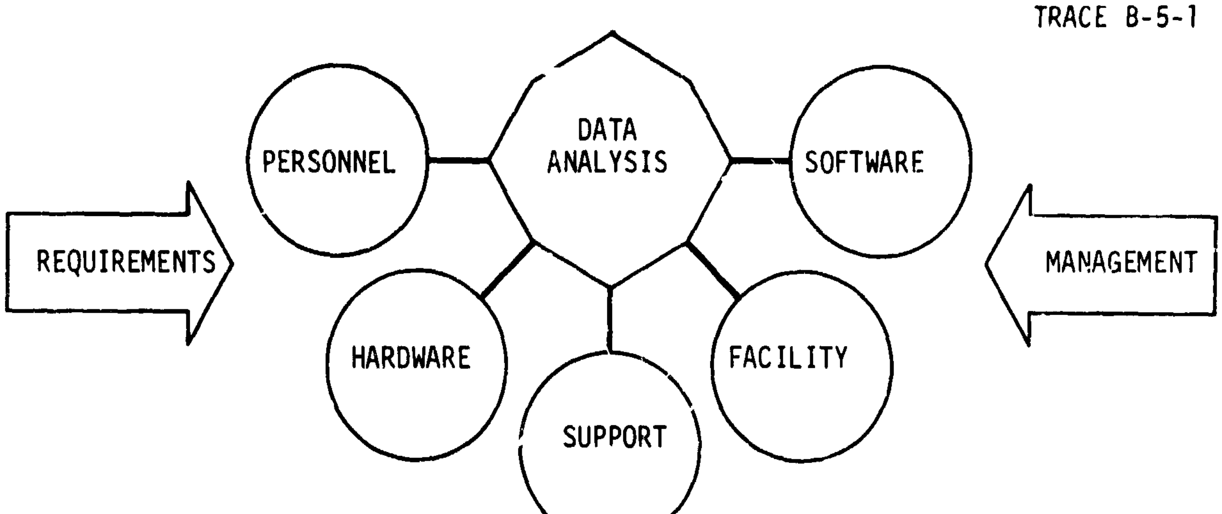
If in-house personnel are to perform the design of room modification and do the fabrication, it should be recorded and coordinated at this point.

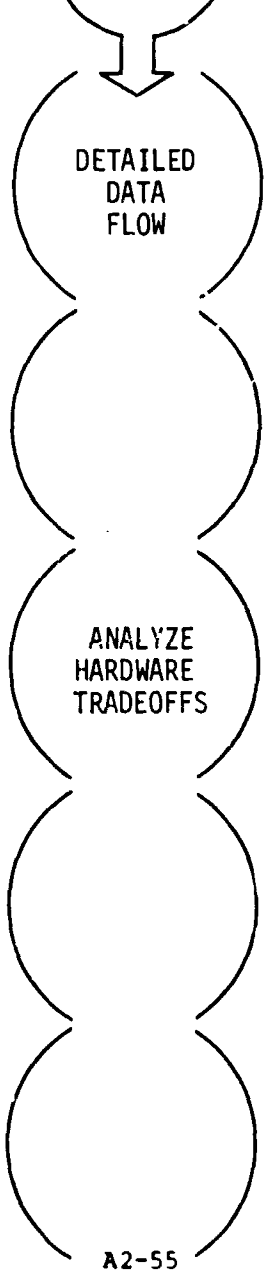
Special supplies such as false flooring, cabling, air conditioning, service, etc., will be identified as a result of reviewing the room modifications necessary. Then, as these needs are listed a decision can be made as to the most cost/effective facility arrangement to implement.

SAMPLE SYSTEM # 2

Since a large facility preparation effort will be necessary it is important to analyze how much and what will be acquired by contract versus performed by government personnel. Space and administrative plans will be affected during facility preparation as well as will funding plans.

A careful analysis of the support needs to the overall mission analysis system will impact on the facility elements by indicating storage room requirements, maintenance areas, and special equipment test facilities that are needed.





SAMPLE SYSTEM # 1

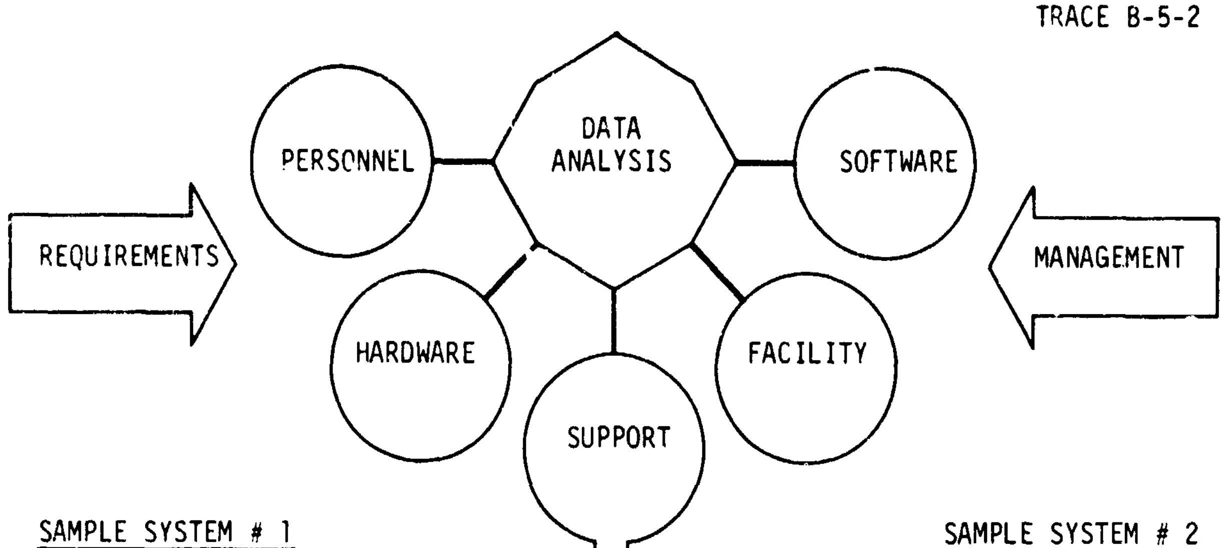
A few minor supplies may be identified as a result of analyzing the data flow carefully. Reference documentation is one element of support that will be needed to guide the operator's activities at the console station.

There will be a minor effect on support elements, dependent on the console selected. Reliability, experience, and amount of time the hardware has been in mass production will provide information which will affect support elements needed, such as new reference documentation needed or confidence that proven, complete documentation is available.

SAMPLE SYSTEM # 2

The data flow will be very important in this system for analyzing the supply tradeoffs as a result of identifying supply needs. Maintenance plans and reference document preparation plans will be key support elements that should be initiated at this time.

Since a great number of complex equipments of different types will be included in this system, a careful analysis of their supply, maintenance, and reference documentation needs is warranted in order to sum up hardware-related support elements.



SAMPLE SYSTEM # 1

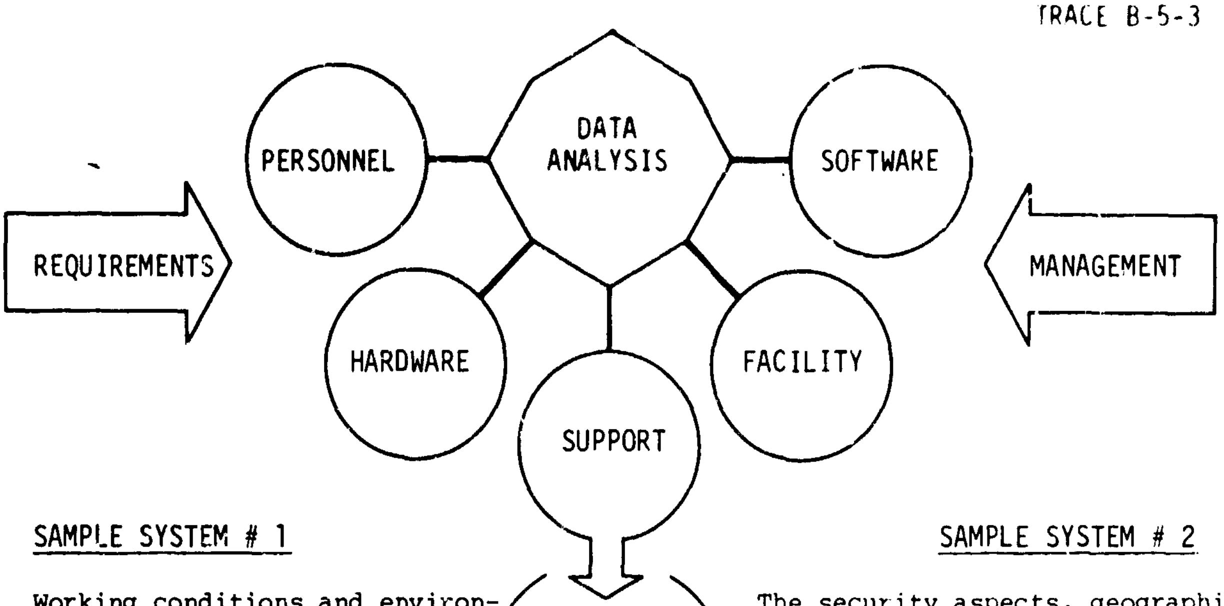
This analysis will determine the need for support programmers over a certain period of time during the life of the system which indirectly causes a need for supplies, or administrative support elements.

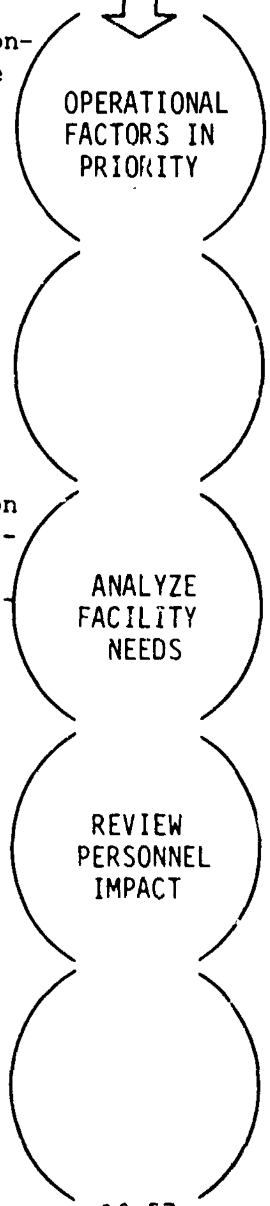
Not applicable for sample system # 1.

SAMPLE SYSTEM # 2

This analysis will similarily determine the need for support to on-site programmers over certain periods of time during the operation of the system. This will help define related supply needs and housekeeping requirements.

This analysis will identify the initial supplies and maintenance services to be acquired in lieu of all the support elements in case of a fund limitation imposed on the procurement schedule for the operating systems.





SAMPLE SYSTEM # 1

Working conditions and environmental characteristics of the console station area will help determine whether maintenance can be performed at that point or whether the equipment must be moved for maintenance.

The work station configuration and location within the facility will have a minor effect on support elements like periodic janitorial needs with instructions to cleaning personnel about equipment care.

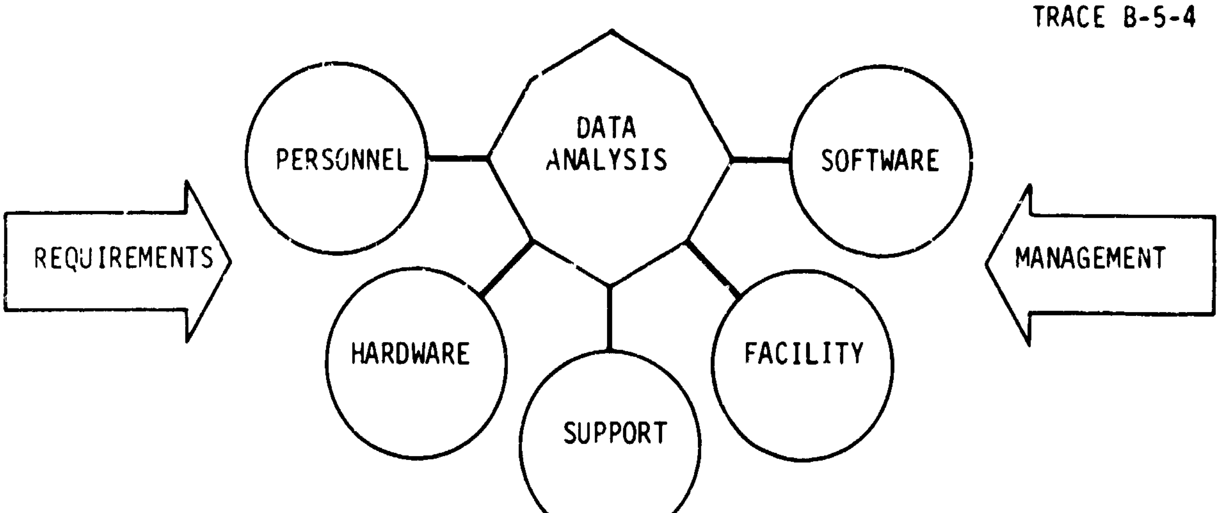
Supply, maintenance, and housekeeping personnel will require some information as a result of this system being installed, even though their connection to the system will be minor.

SAMPLE SYSTEM # 2

The security aspects, geographic location, and military combat situation expected for the system environment should be examined so that proper support service acquisition procedures can be developed.

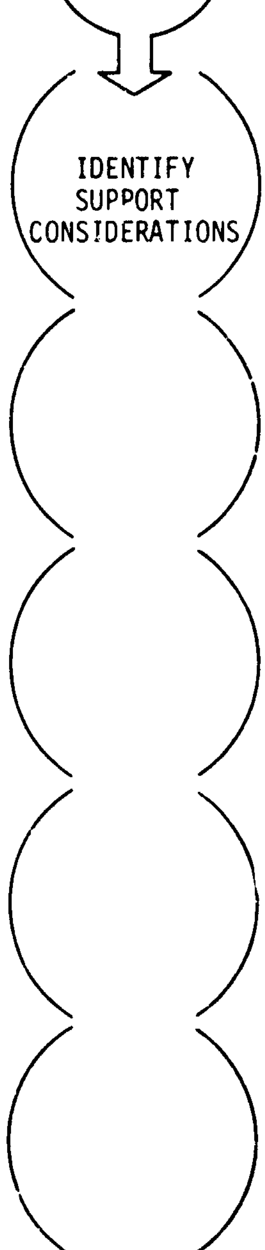
The size and type of facility planned will identify housekeeping services needed.

The support elements related to performing support operations with military personnel, civilian government personnel, or contractor personnel will be affected by analyzing the manning levels and skills to be available at the system's operational site.



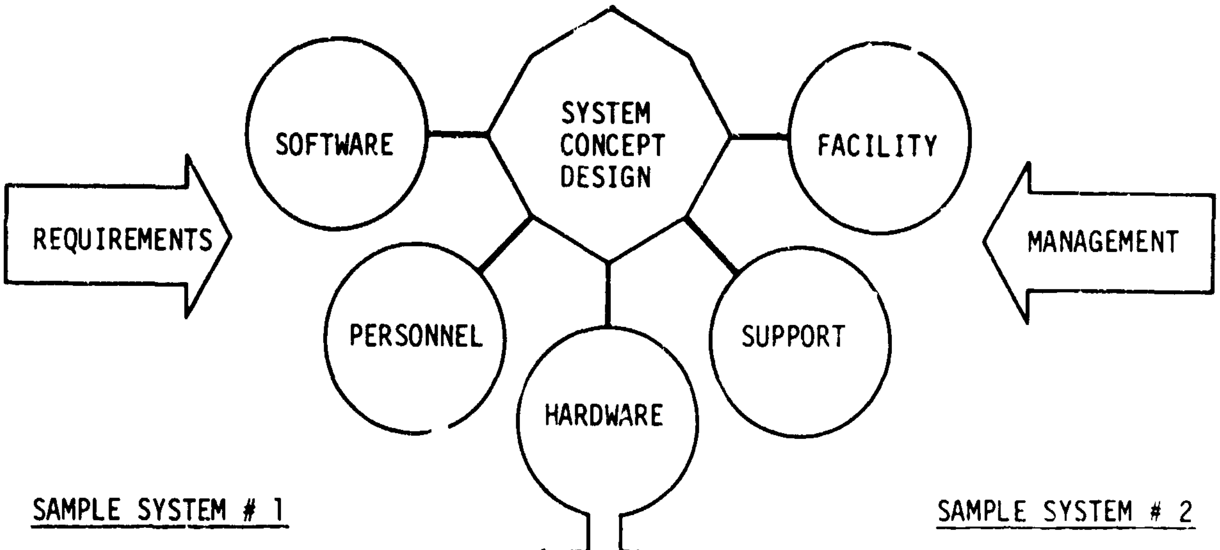
SAMPLE SYSTEM # 1

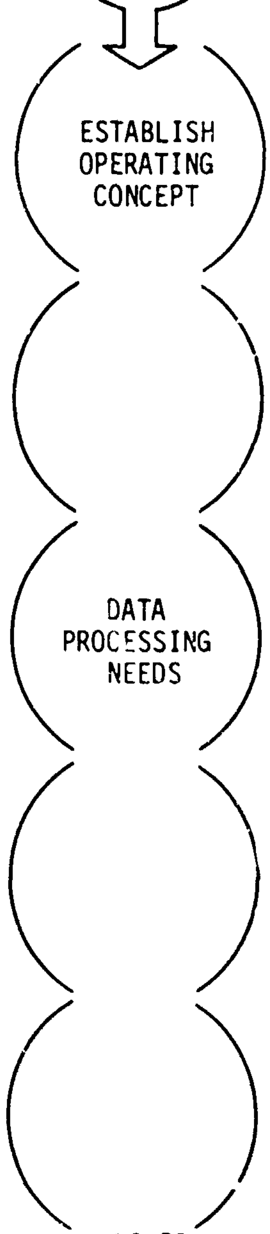
This summarizes the system support aspects of the system as mentioned throughout the previous steps and results in schedule and cost estimates for support activities.



SAMPLE SYSTEM # 2

This summarizes the system support aspects so that initial preparation schedules and budgetary cost estimates for support elements can be prepared and staffed through management.





SAMPLE SYSTEM # 1

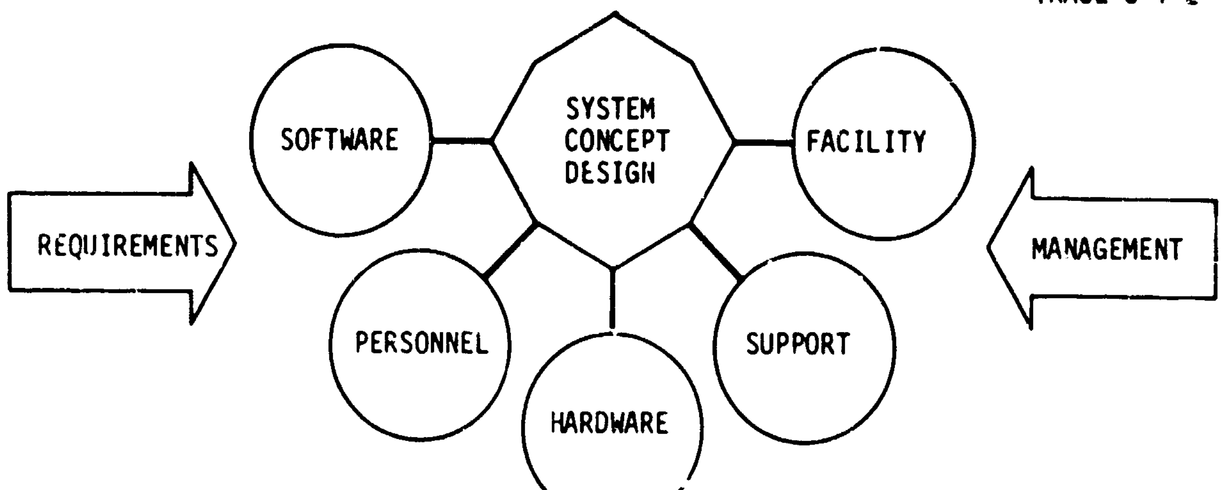
The operating concept has already been established at the point of project initiation for this sample system. The CRT display console work station has been directed from the beginning.

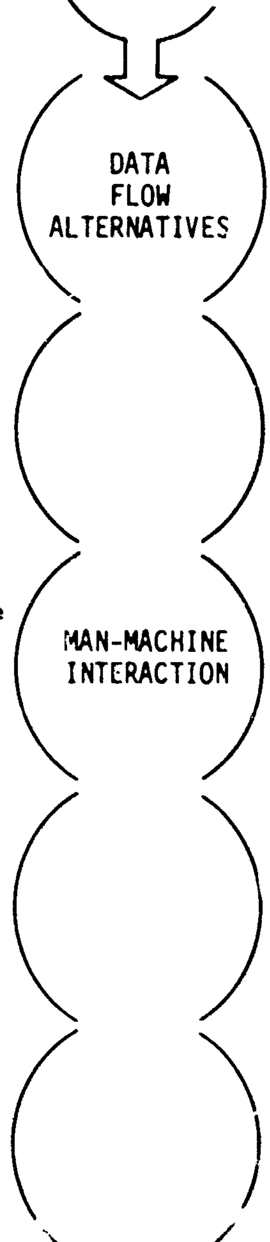
An analysis of data rates, program needs, and operating conditions imposed on the available computer may result in a need for special buffer or interface components. This should be decided in this step by illustrating and describing the data processing needs for the system concept design.

SAMPLE SYSTEM # 2

The overall operating concept is very important to record at this point for coordination purposes. Many types of equipments will have to be interfaced through manual operation or direct automatic connection. At this point individual hardware performance characteristics can be compared to the performance for each item as derived from the system configuration when connected or arranged as an integrated system.

The data processing needs will be summarized into a system concept in order to decide the amount of on-line time-sharing processing support and the off-line, batch processing support to be used in this system. The data processing hardware selected will also be affected by this activity and resulting decisions.





SAMPLE SYSTEM # 1

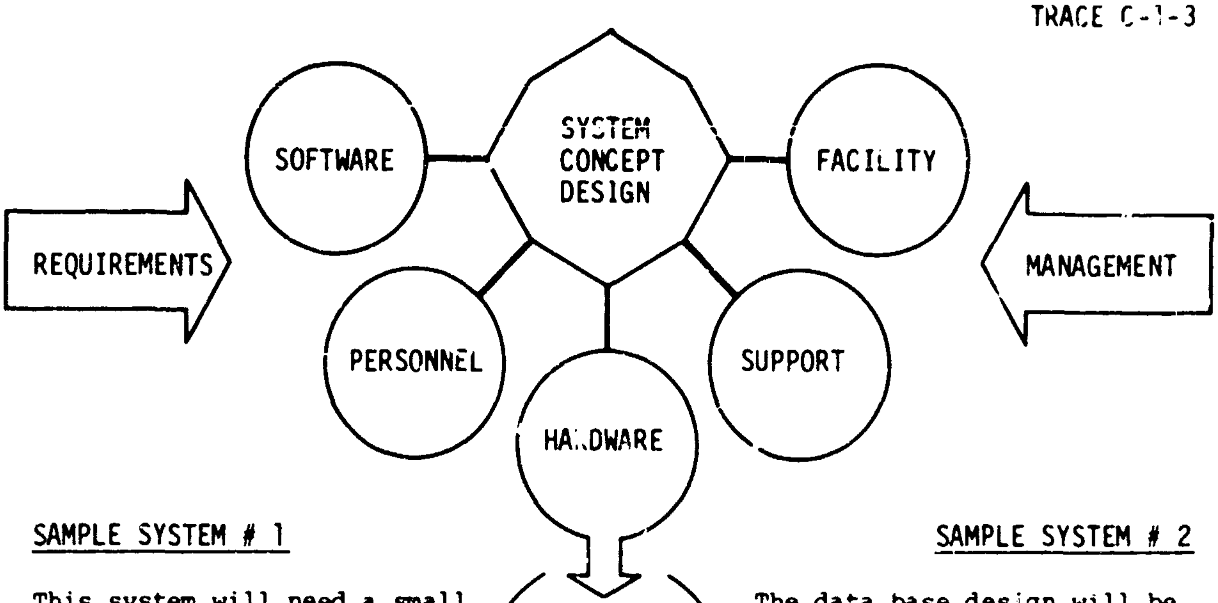
All the alternative work station man-machine procedures should be recorded so that any hardware changes in the system console features can be identified. Then one alternative will be selected which will help define the detail console characteristics.

This step is the same as the previous step for this sample system.

SAMPLE SYSTEM # 2

Alternative data flows will help adjust portions of the system hardware configuration to take advantage of the best hardware at various points in the system. The system hardware concept should be decided only after careful review of these alternative data flows.

In a large system such as this where its main role is to support human decisions and analysis activities, the man-machine interaction nodes should be highlighted in the system concept design. Hardware adjustments can be considered where cumbersome of ineffective man-machine operations are evident.



SAMPLE SYSTEM # 1

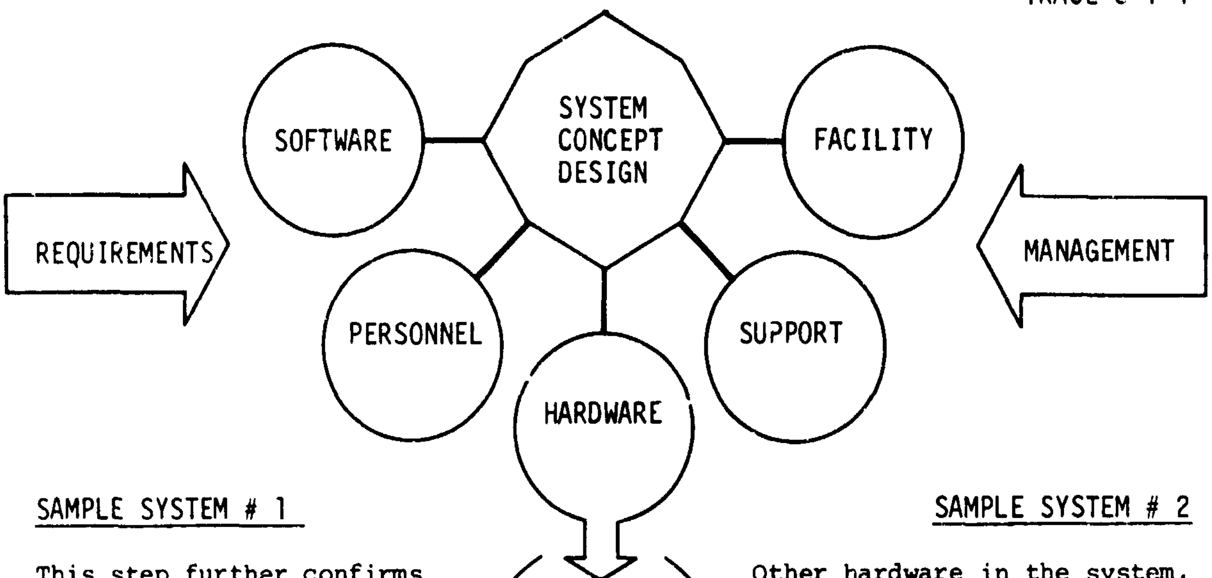
This system will need a small data base design in order to facilitate filing approved display messages and retrieving them at a later time. This step is one of the most important to perform at this time in order to assure that the computer hardware available will handle this work load.

This helps to confirm the hardware configuration, which is the CRT display work station and the given computer components.

SAMPLE SYSTEM # 2

The data base design will be very crucial if the system concept includes an on-line, time-sharing computer support component as a portion of the mission analysis system. The type of file management system to be used and the utility of data by different on-line stations will affect the computer components and console hardware specifications.

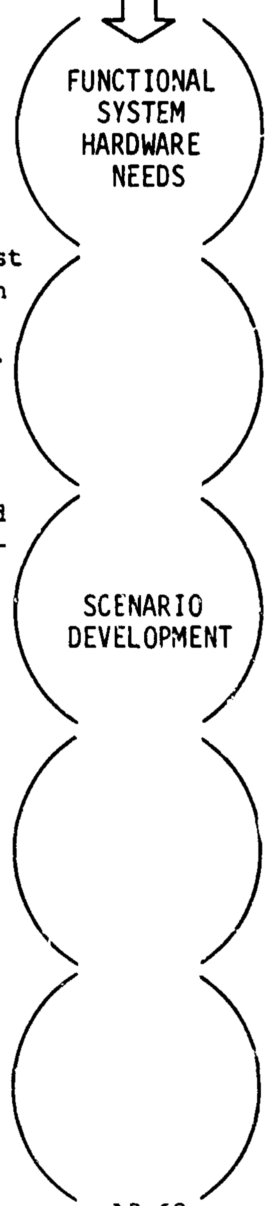
The application software will be dependent on the man-machine procedures to be supported and any hardware that is decided to be used. Careful review of the application programs to be used at the various on-line terminals will again validate and help specify terminal equipment characteristics. It will also determine program storage requirements.



SAMPLE SYSTEM # 1

This step further confirms that the computer component is ready to support the on-line console station activity. The hardware features and detailed characteristics such as timing, mass storage space, access time, etc., must be evaluated and reflected in the data processing portion of the system concept design.

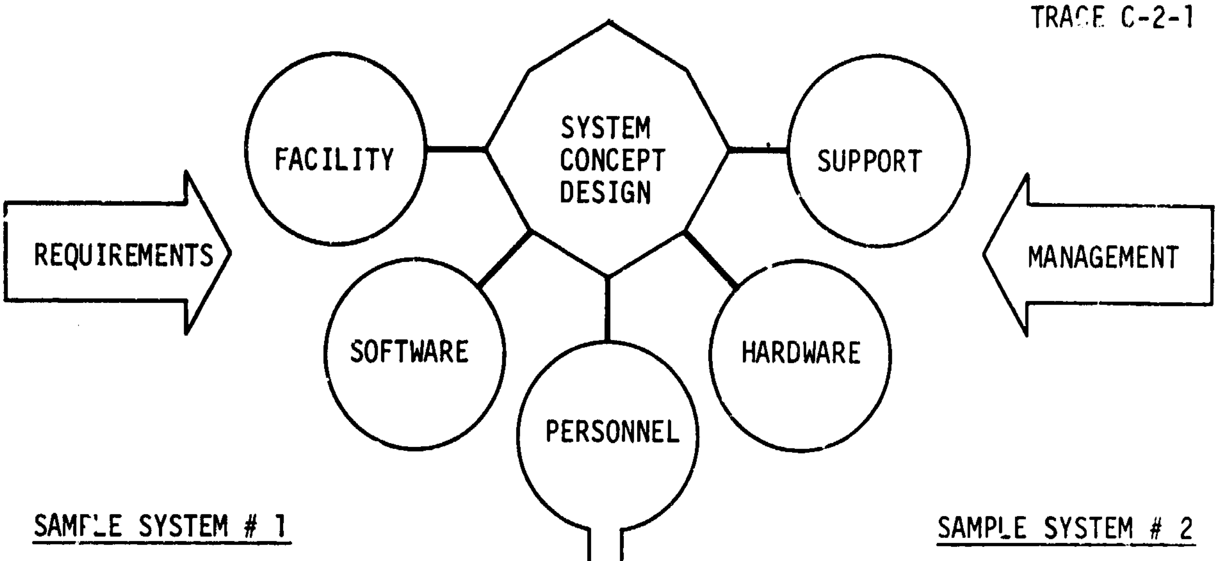
An initial set of data should be developed that will illustrate how the console will be used and what information will be displayed at the work station over a sample period of operating time. This will help validate the console design as well as the computer component capabilities.

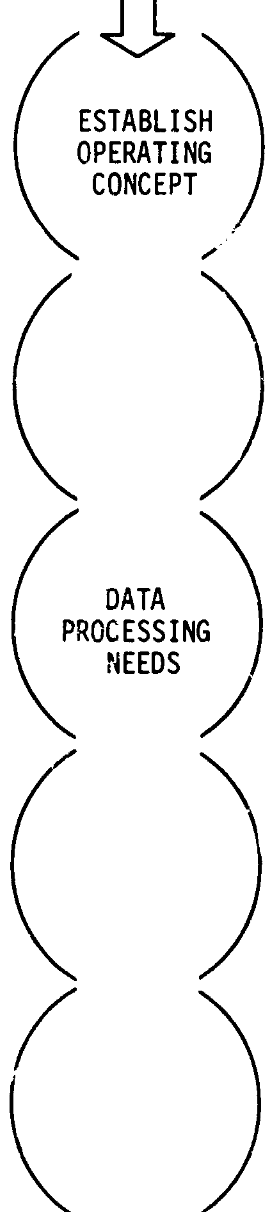


SAMPLE SYSTEM # 2

Other hardware in the system, such as viewers, plotters, reproduction equipments, etc., should be placed in context with the electronic data handling equipments oriented around the operating station positions. The detailed hardware features of each of the items can then be evaluated as they fit in a system configuration.

The tactical mission analysis scenario can be very complex, but need initially only contain the priority conditions for the concept description. Critical time, accuracy, work load, and environmental conditions should be listed. The hardware elements within the conceptual system can then be evaluated as the scenario is exercised analytically against them. This will be the start of the baseline exercise planning and should be the final study prior to systems hardware specification.





SAMPLE SYSTEM # 1

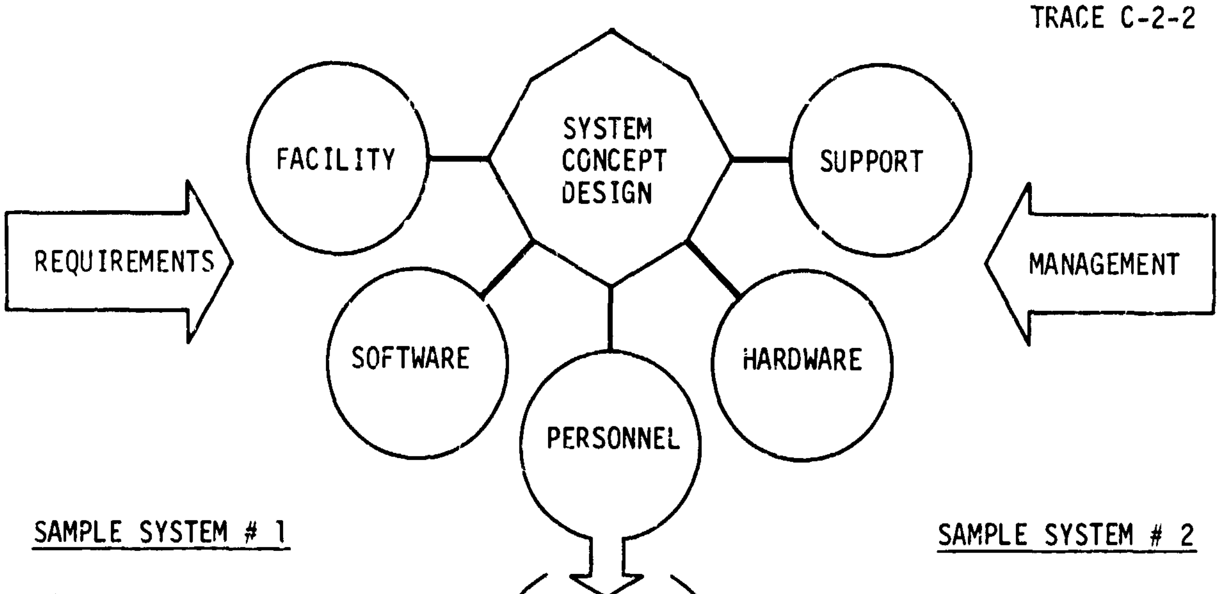
A very minor effect on personnel elements will result from a re-definition of the system concept at this stage for sample system # 1.

A very minor effect on personnel elements will result from a re-definition of the system concept at this stage for sample system # 1.

SAMPLE SYSTEM # 2

The system concept will help validate previous personnel elements derived as a result of data collection and data analysis. The concept in total will indicate where a sharing of personnel for multiple operations may be possible based on the operating concept. This could be significant in a large system with many manual tasks that must be performed serially.

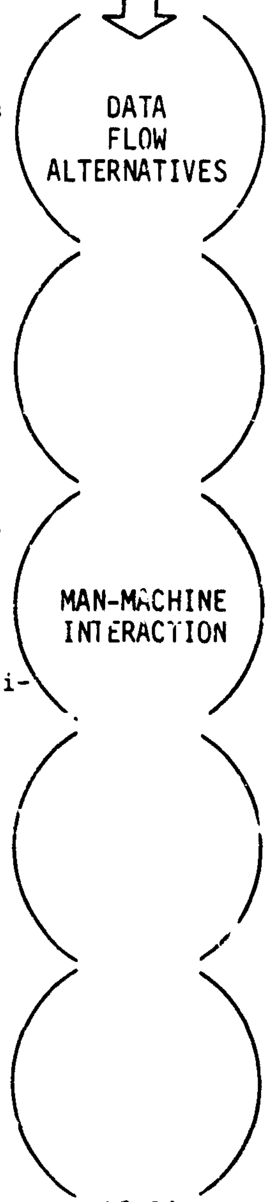
The main effect on personnel elements will be in the area of planning for on-site programming personnel continuously, or at certain shifts, dependent on the system concept and the importance of data processing to the overall concept.



SAMPLE SYSTEM # 1

Since there are no alternatives significant enough to affect the personnel elements in this sample system, this step is not applicable.

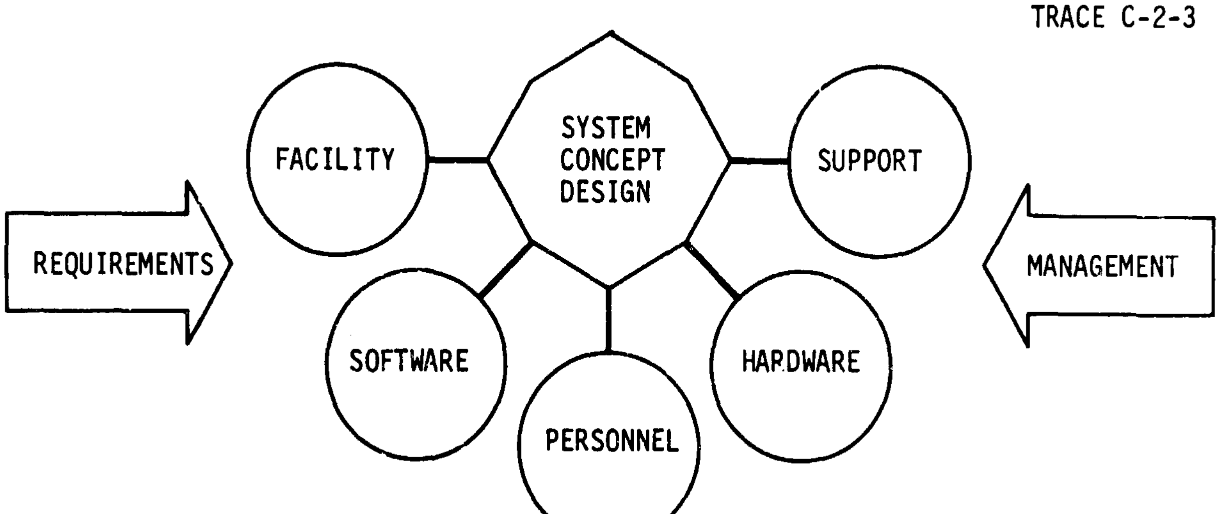
This step provides a check on the operator experience criteria analyzed earlier and validates the personnel assignment plans to be established during the system specification task.

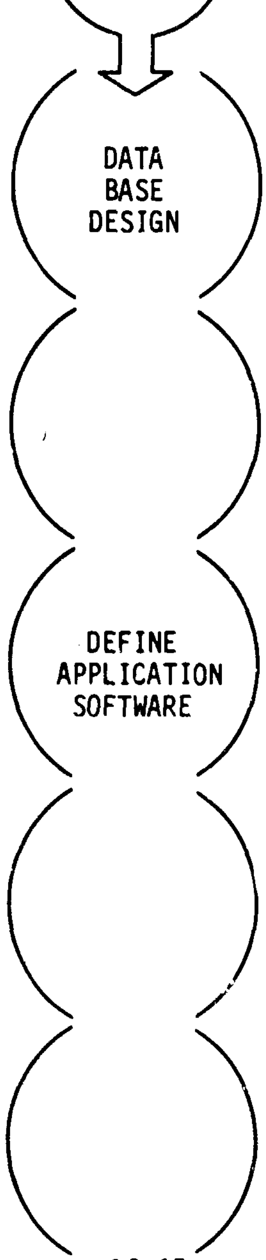


SAMPLE SYSTEM # 2

Data flow alternatives could have an impact on staffing levels and experience requirements as far as personnel is concerned. Specific manual work-stations should have alternative flows outlined to assure that optimum use is made of the people available within the system concept.

The man-machine interaction factors within the system concept are very important from data processing and non-data processing standpoints. Operator training, safety, and scheduling will depend on the human engineering aspects of the system concept and the teamwork advantage accrued by the design of an integrated system versus a number of independent entities.





SAMPLE SYSTEM # 1

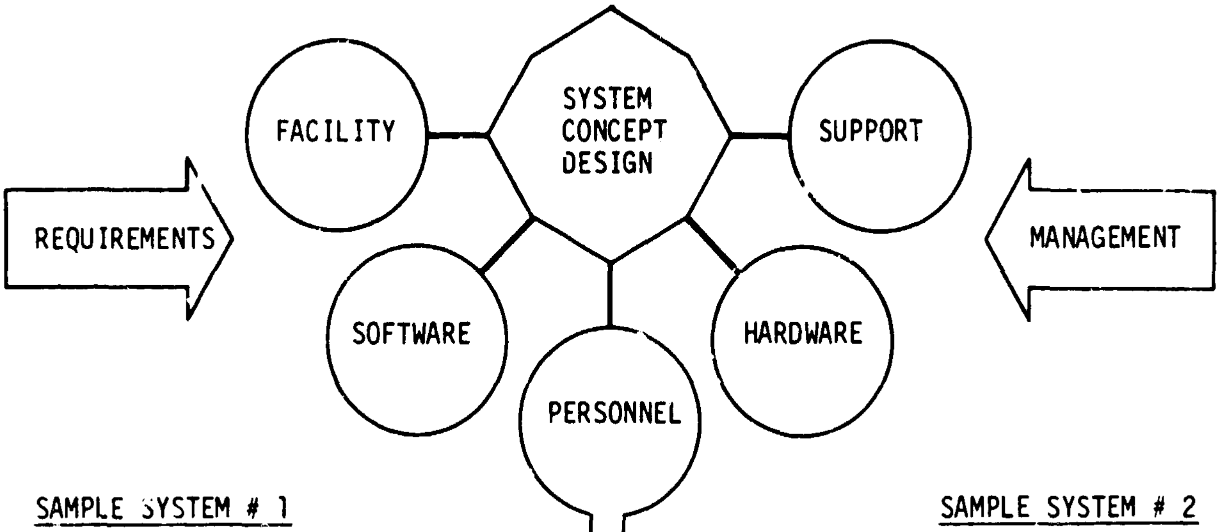
The data base of approved display messages is important to place in context with the console operation and computer components considered as one system. Any problems due to data base needs of the operator not being provided by the envisioned system should be highlighted here in order to adjust the other elements within the system concept.

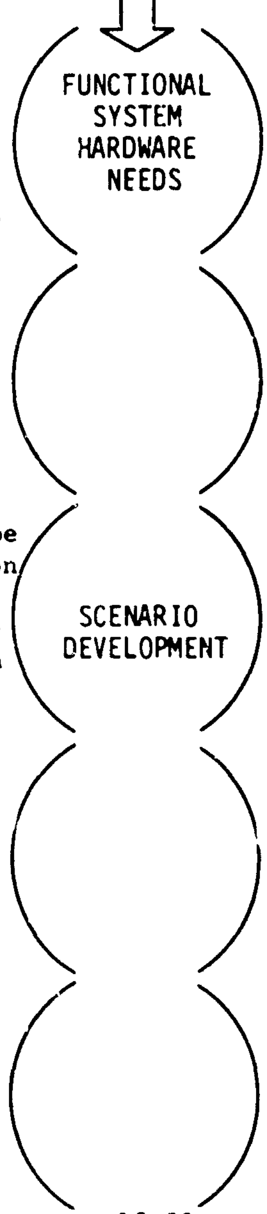
This is not applicable for its effect on system personnel elements for sample system # 1.

SAMPLE SYSTEM # 2

The data base has a relatively minor impact on personnel, except from a standpoint of manually creating the initial set of files. The stations' operating procedures will be impacting on the data base. Here, the data base should be developed with the personnel procedures in mind.

This step does not affect the operational personnel to any extent. It does indicate who must produce the application software as the programs are established within the system concept and helps decide whether an experienced software staff is available or unavailable.





<u>SAMPLE SYSTEM # 1</u>

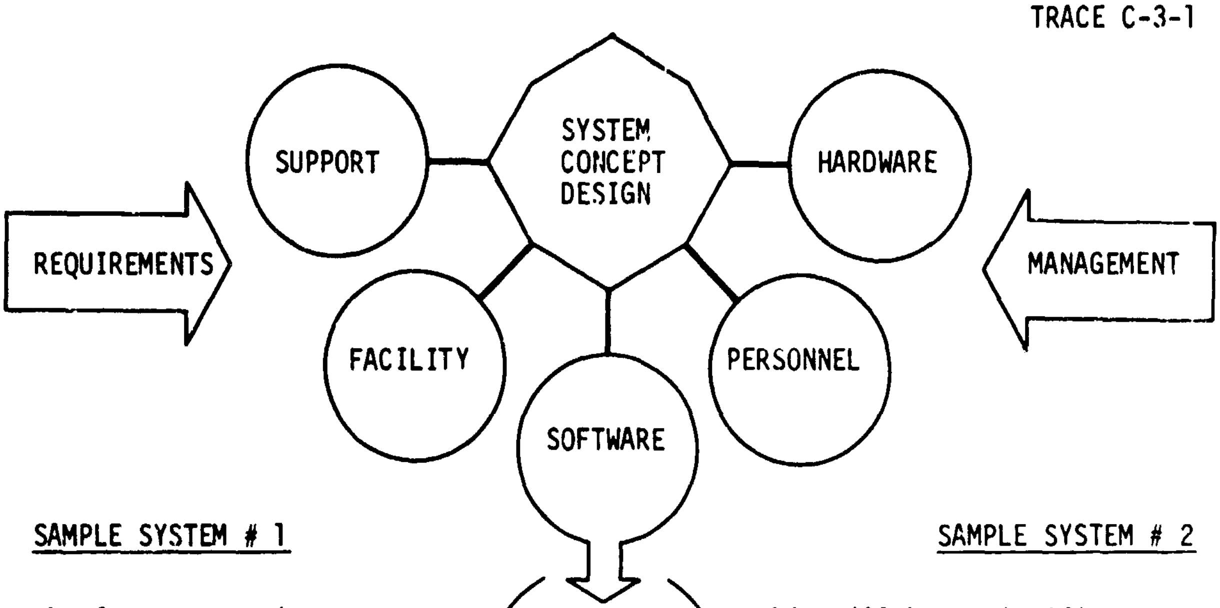
No other equipments except the CRT display console are needed; therefore, the hardware placed in a system concept presentation will not affect the personnel elements for sample system # 1.

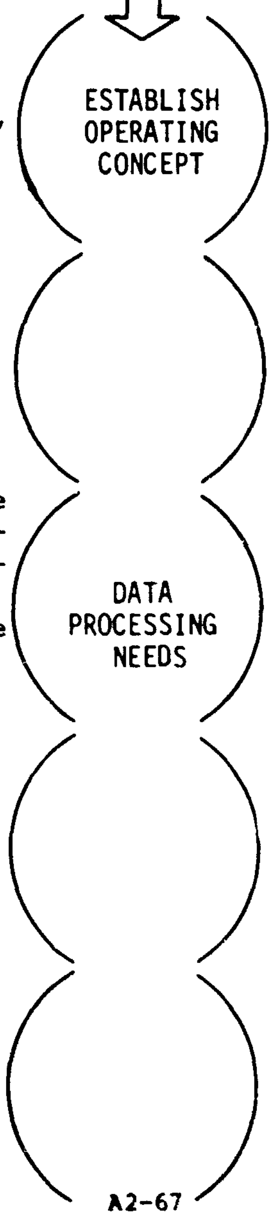
The scenario developed will be presented so that coordination can take place with operational or management personnel and preliminary plans can be established for baseline exercising of the console station later in the evolution of this system.

<u>SAMPLE SYSTEM # 2</u>

All equipments that require human operators will be in proper place within the system concept. This will help validate training requirements and should be coordinated with operational training organizations at this time.

The training aspects for the preparation of a set of given data and the scheduling of future personnel to use this scenario during baseline exercising will be assisted by this step. Many functions are involved in this system and the scenario of the type needed here will require a great amount of user coordination and participation during development.





SAMPLE SYSTEM # 1

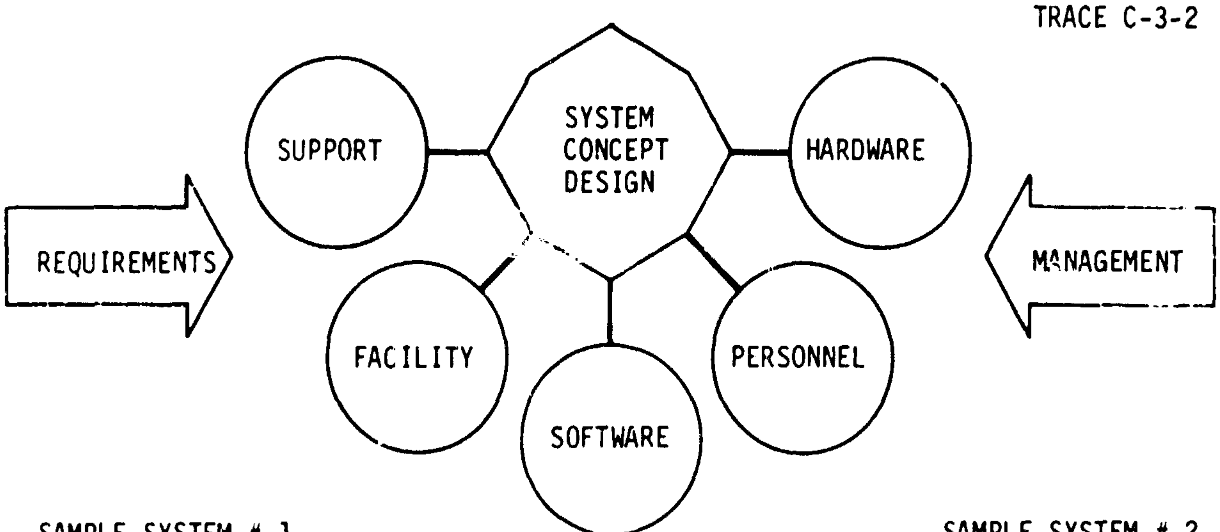
The data processing concept, i.e., tape storage, disk storage, file system concept, and the console operator language concept will affect the software to be developed for this sample system. The system concept design will help tie the operating system and application program areas together.

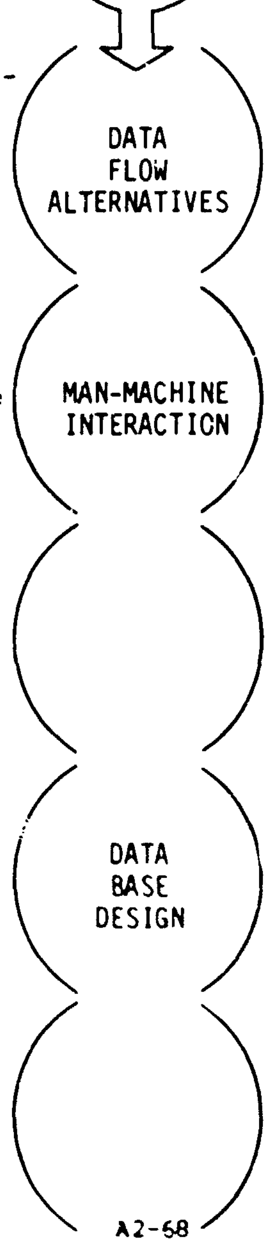
This step will identify those program packages to be provided by assuring that the candidate available software packages do or do not fit the overall concept.

SAMPLE SYSTEM # 2

This will be a significant step towards indicating the system software and the many application software packages to be provided. The operating concept will indicate the relative importance and place of time-sharing versus batch type software packages.

This step will result in a summarv of application software routines and operating software concepts to be further specified in the next task. This step must identify the number and frequency of program interrupts anticipated in the on-line time-sharing user situations in order to specify the computer components' data transfer philosophy.





<u>SAMPLE SYSTEM # 1</u>

This step is of minor significance in this sample system because of very few alternatives available for data flow.

The specific procedures for the operator to follow while operating the display console and the decisions to be made will help define the application programs in this system.

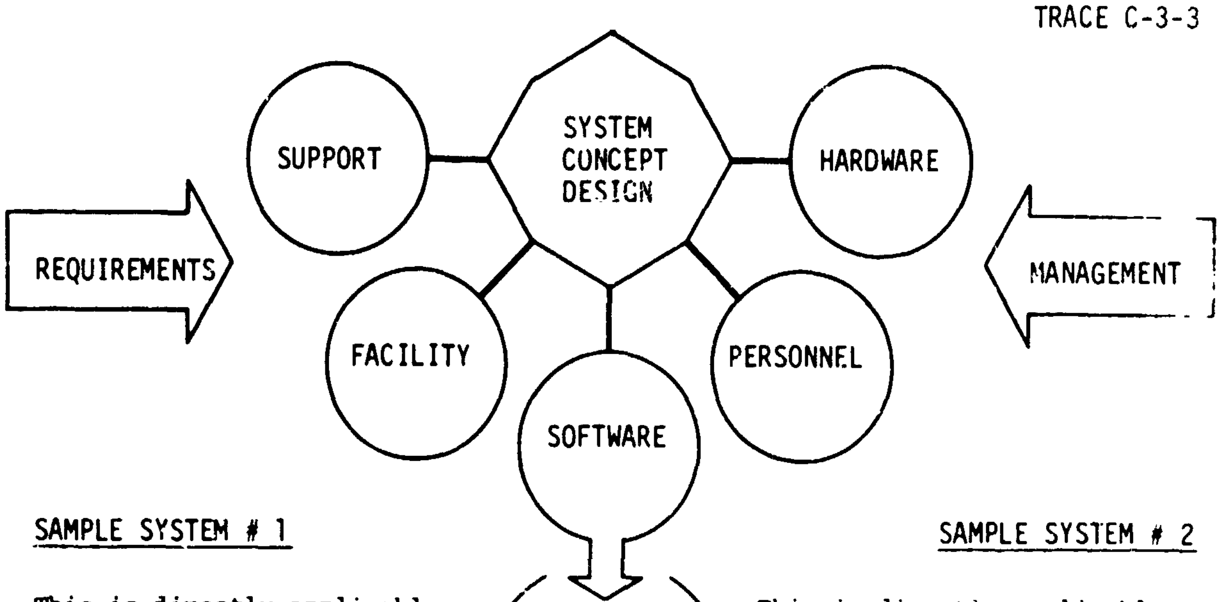
The data base design needed will determine whether the existing file management system and operating system software is acceptable. This step is important at this point even in a small system as this where an operational computer complex is assigned for use at the beginning. Surprises do occur with software that is assumed to work.

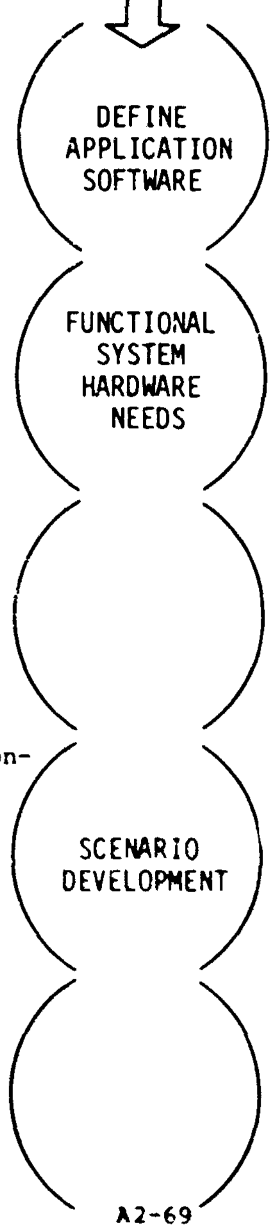
<u>SAMPLE SYSTEM # 2</u>

Data flow alternatives at the man-machine stations and across the major functional areas will help resolve program approaches that can be most efficient or used at more than one place in the system.

The application programs will be validated at this point. This step is very important where different operator stations require different on-line equipments and as a result--different sets of application packages. The user console language concept should be decided at this point.

The data base design is very important here in order to define the file management system(s) required. More than one may be required if multiple computers are used for widely different functions within this particular system.





SAMPLE SYSTEM # 1

This is directly applicable to validate the software element specifications to be developed in the next major system analysis task.

This is not applicable in this sample system due to the fact that the given system only contains one CRT display console and no other functional equipments.

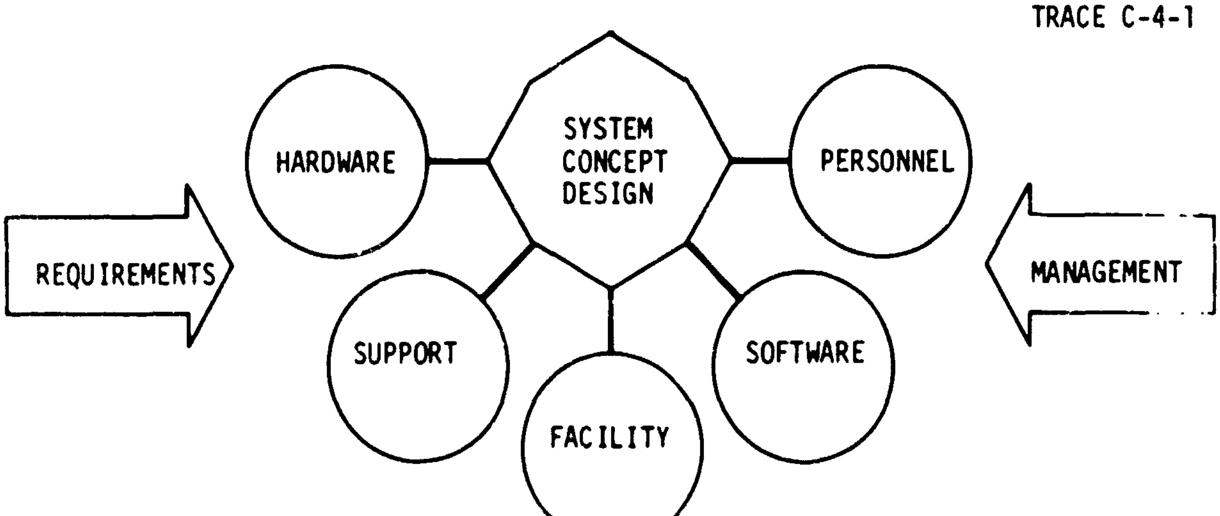
A pre-prepared file of environmental-related messages to be displayed on the CRT console will be defined within the system concept as a result of the scenario characteristics.

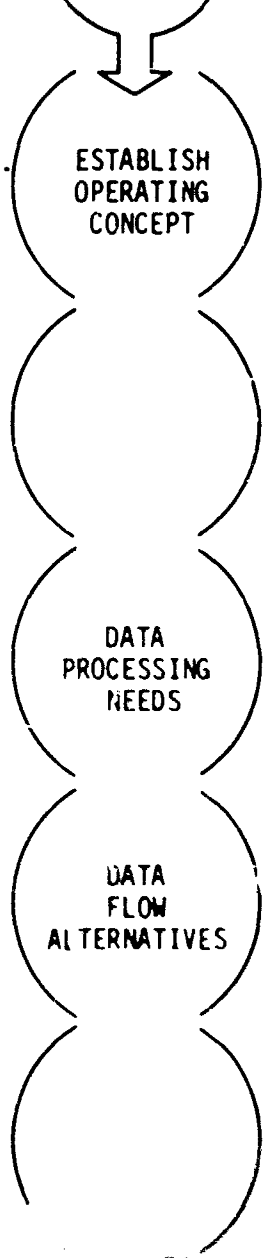
SAMPLE SYSTEM # 2

This is directly applicable to validate the software element specifications to be developed in the next task.

Many hardware stations will be included in this system such as digital plotters and automated photographic image measuring sub-systems. These equipment needs relative to the computer component(s) should be defined here prior to deciding on all the application program needs.

This system will involve a very complex scenario and work must be started on it at this point. Files will have to be created for baseline exercises, and the software needs will have to be identified which will assist in the creation and use of the initial data base. This initial data base will reflect the scenario.





SAMPLE SYSTEM # 1

This step will not be applicable in affecting facility elements for sample system #1.

This step will not be applicable for this sample system as far as facility elements are concerned.

This step will not be applicable for this sample system as far as facility elements are concerned.

SAMPLE SYSTEM # 2

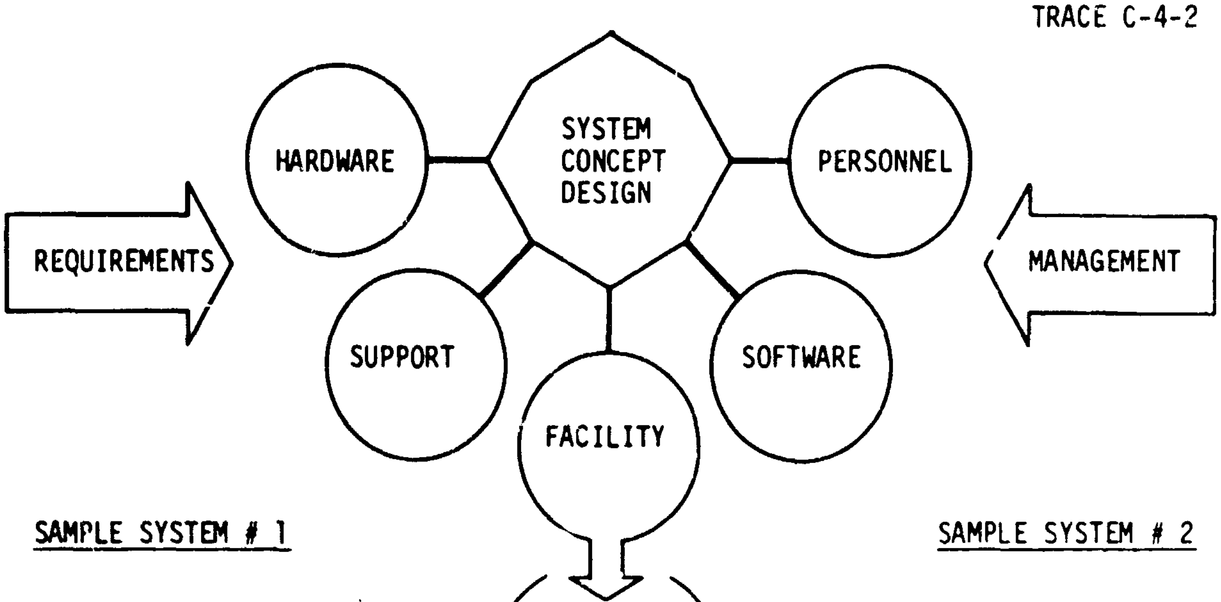
The operating concept must be carefully developed as part of the total system concept, because facility configuration for this size system can be greatly affected by criteria such as:

1) Continuous operation
2) Many people moving arcund at the same times.
3) Rapid set-up and mobility capability being necessary features of the system.

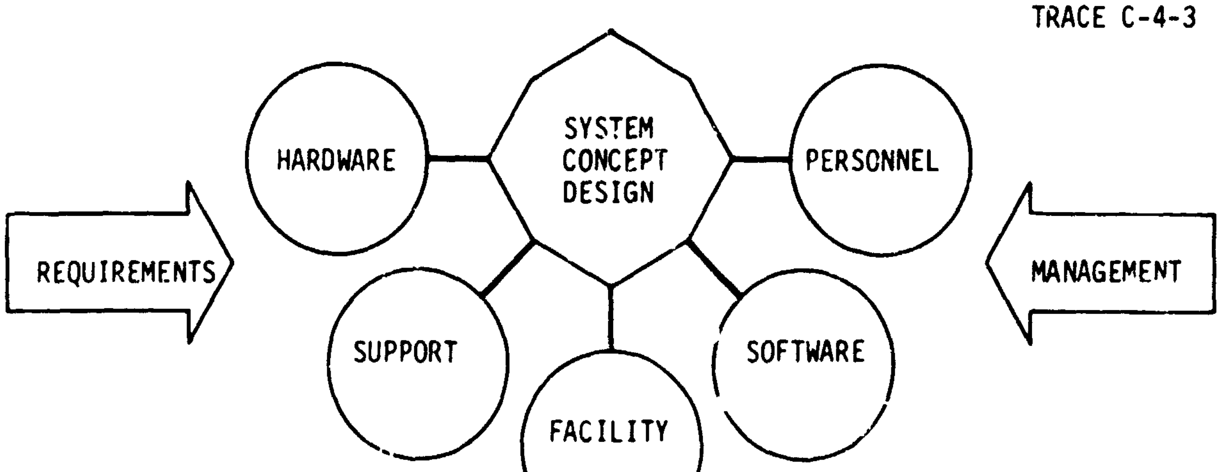
This will indirectly affect the facility as it relates to the support elements which include programming personnel and supp˙ies to be on-site with the system hardware and within the same facility.

This could affect basic facility construction decisions and internal room layout plans.

TRACE C-4-2



SAMPLE SYSTEM # 1		SAMPLE SYSTEM # 2
This will only be applicable as far as the need for the CRT display console operator to physically interact with the high speed printer portion of the computer component.	MAN-MACHINE INTERACTION	This step is not too important for facility element determinations; however, it will help validate the layout of the operational work areas for this system.
This step will not be applicable for this sample system as far as facility elements are concerned.	DATA BASE DESIGN	This step will not be applicable for this sample system as far as facility elements are concerned.
This step will not be applicable for this sample system as far as facility elements are concerned.	DEFINE APPLICATION SOFTWARE	This step will not be applicable for this sample system as far as facility elements are concerned.
Since the on-line display station is the only equipment complex of concern this step is of minor consequence in facility element definition for sample system # 1.	FUNCTIONAL SYSTEM HARDWARE NEEDS	Many equipments of various sizes and weights will be required. The environmental needs and supply needs of each item should be considered in view of the location within the facility as part of the system concept design. This could affect the facility element specification and is an important analysis to perform at this time.

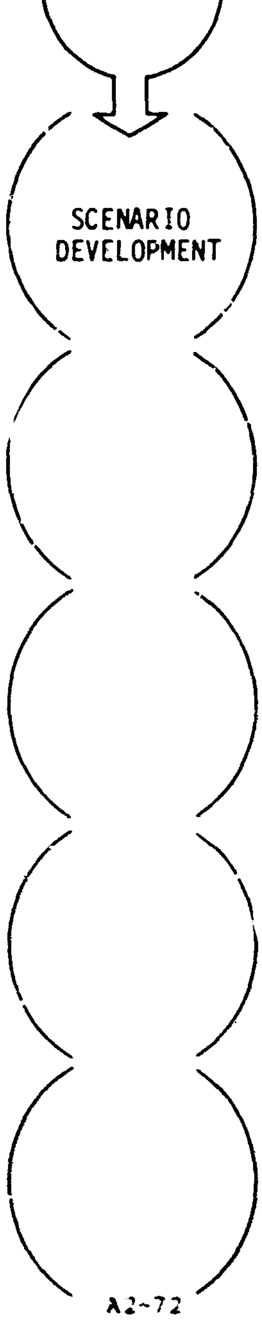


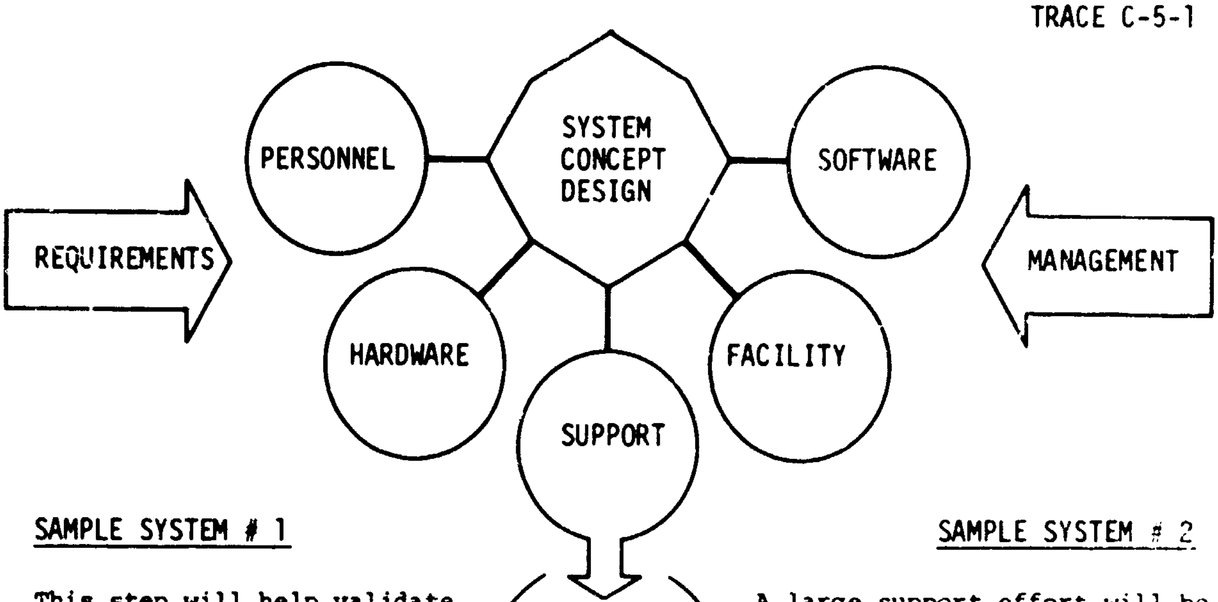
SAMPLE SYSTEM # 1

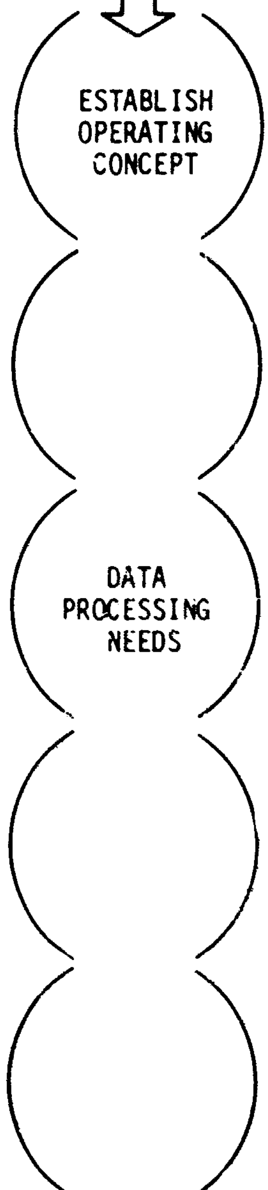
This step has minor significance as far as physical storage space for scenario-related materials to be used in sample system # 1.

SAMPLE SYSTEM # 2

This step has minor significance only as far as physical storage space may be required to house the materials associated with a scenario during baseline exercising.







SAMPLE SYSTEM # 1

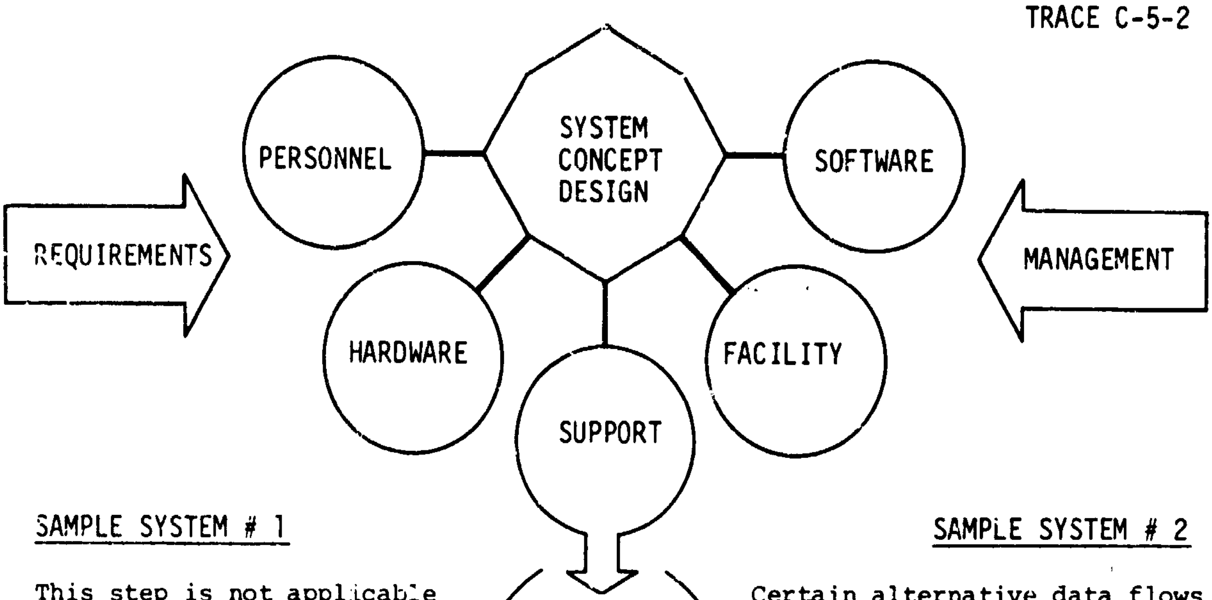
This step will help validate the support elements derived from the previous task of data analysis. Minor change will result from this step for sample system # 1.

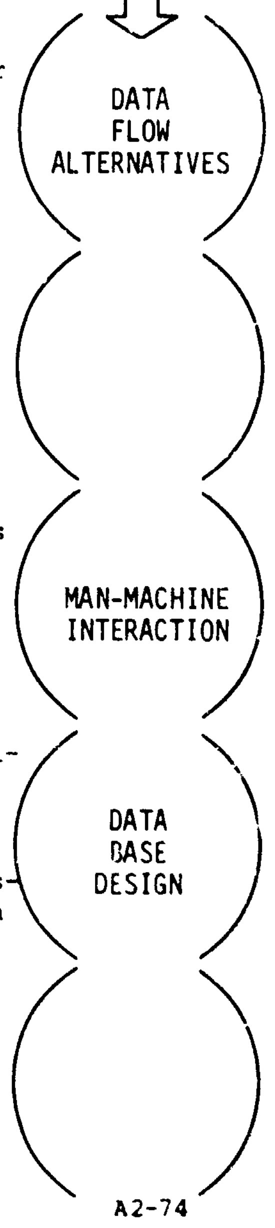
This step will help validate the support elements derived from the previous task of data analysis. Minor change will result from this step for sample system # 1.

SAMPLE SYSTEM # 2

A large support effort will be required for this system and a system concept design will help coordinate the preparation for this support. The operating concept will help rank alternative supply, maintenance, training, and documentation requisition plans.

This step will summarize all software needs and computer supplies requirements and indicate the support elements for these activities. On-site programmer support elements will be the most significant items to determine.





SAMPLE SYSTEM # 1

This step is not applicable for this sample system as far as support elements are concerned.

This step is not applicable in affecting support elements at this time in the development of sample system # 1.

This step is of minor significance to support elements. It could affect coordination and administration actions if a data base is to be transferred from some other system to this one at some time.

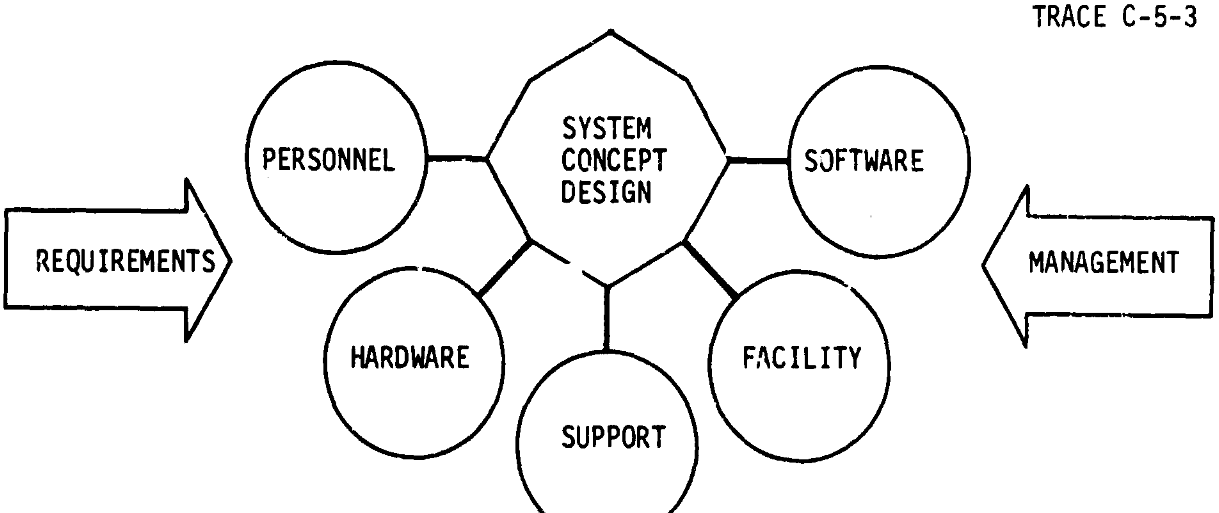
SAMPLE SYSTEM # 2

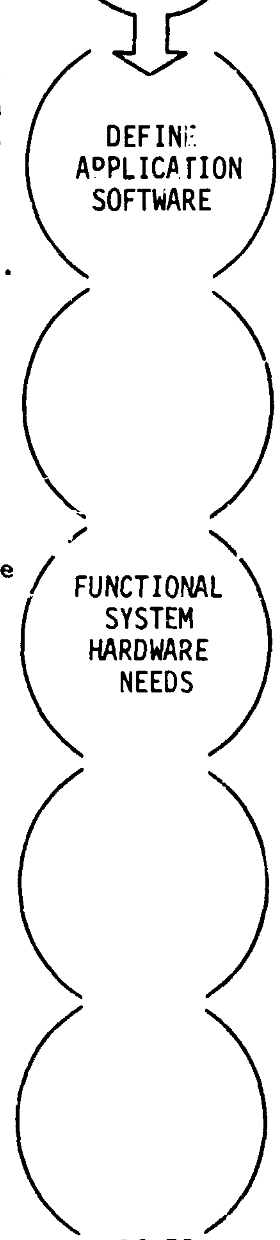
Certain alternative data flows at key operational points within the system should be evaluated within the total system concept for support element effects, such as:

1) Supply needs
2) Training level needed
3) Amount of reference documentation
4) Manning levels affecting housekeeping accommodations.

The man-machine interaction details do not affect support elements at this point in the system analysis effort. They will as previous assumptions in this area are changed which change supply needs.

The data base design step can lead to an estimate of the data base implementation effort at this point. This will indicate possible support needed from interface organizations or from contractor assistance.





SAMPLE SYSTEM # 1

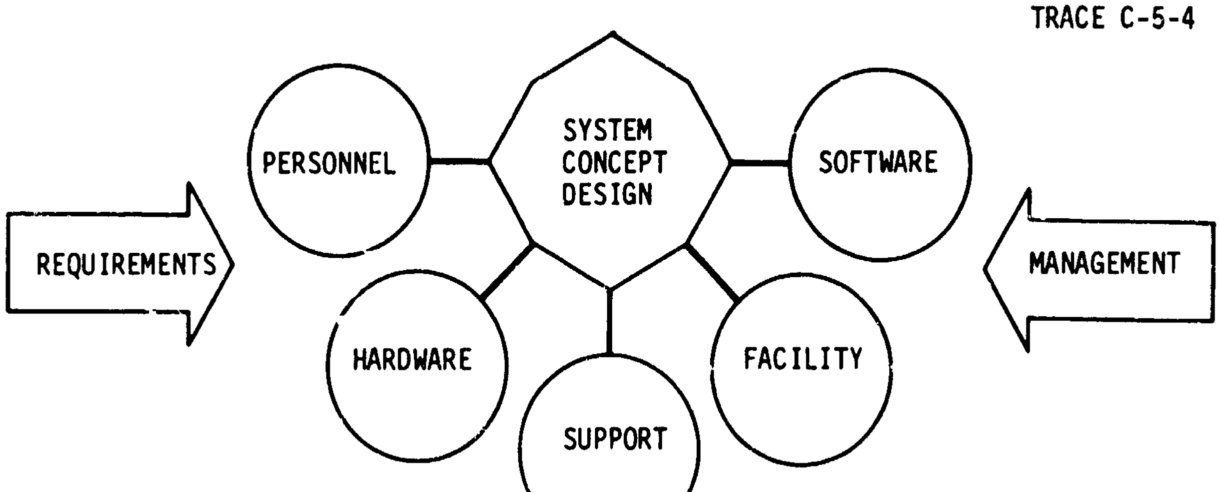
This step has minor significance unless the application software development work is considered to be a support operation and will be accomplished after operational installation of the hardware.

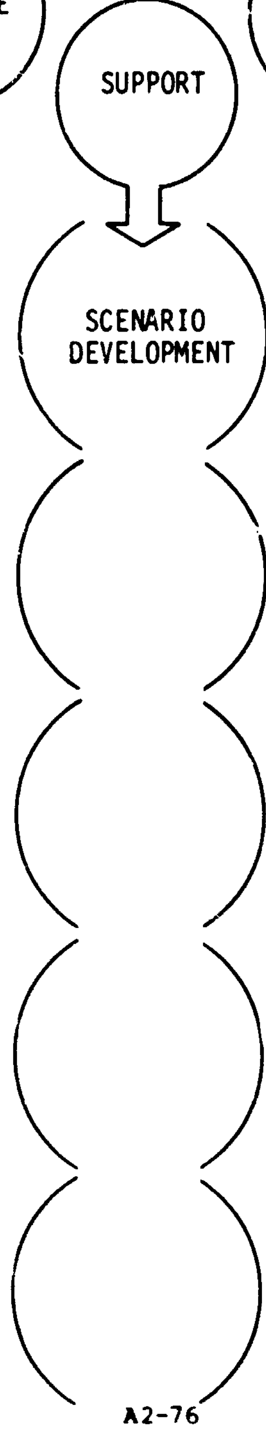
This step has a minor affect in sample system # 1, because there is no other functional hardware at a man-station other than the one CRT console.

SAMPLE SYSTEM # 2

This step is important since programming support is categorized as a support element in some instances. In this system the long-term "after-operational-acceptance" programming activity would be of a support nature. It will be a significant effort to plan on, and support elements related to that activity should be identified now.

The many hardware items such as communication, measuring, viewing, plotting, storage, reproduction, and other devices must be totaled in number, and their utility must be estimated to determine supply and maintenance support needed. This is a critical step to perform at this time so that proper coordination can be handled, and so the system concept design will be meaningful for management evaluation.



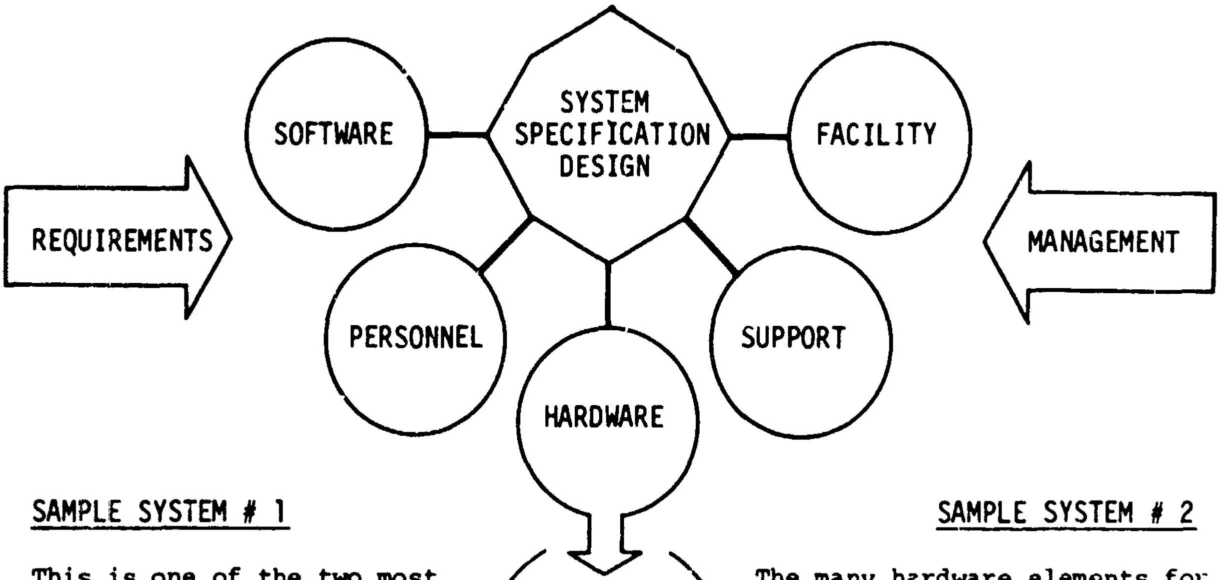


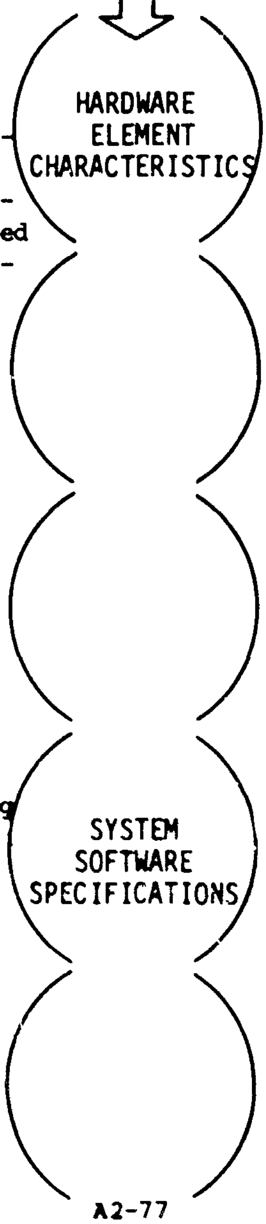
SAMPLE SYSTEM # 1

This step has an effect on support elements if an outside group must produce the scenario materials in support of the system concept. For this sample system it is not a major item of importance since the scenario is small and only consists of a set of files.

SAMPLE SYSTEM # 2

The scenario development will affect the need for support if an outside group or a large group is involved in the preparation and later exercising of the scenario. In this case, this will require a great amount of support activity. This point should be highlighted at this time, because of the need to start this activity early, prior to baseline exercising.





SAMPLE SYSTEM # 1

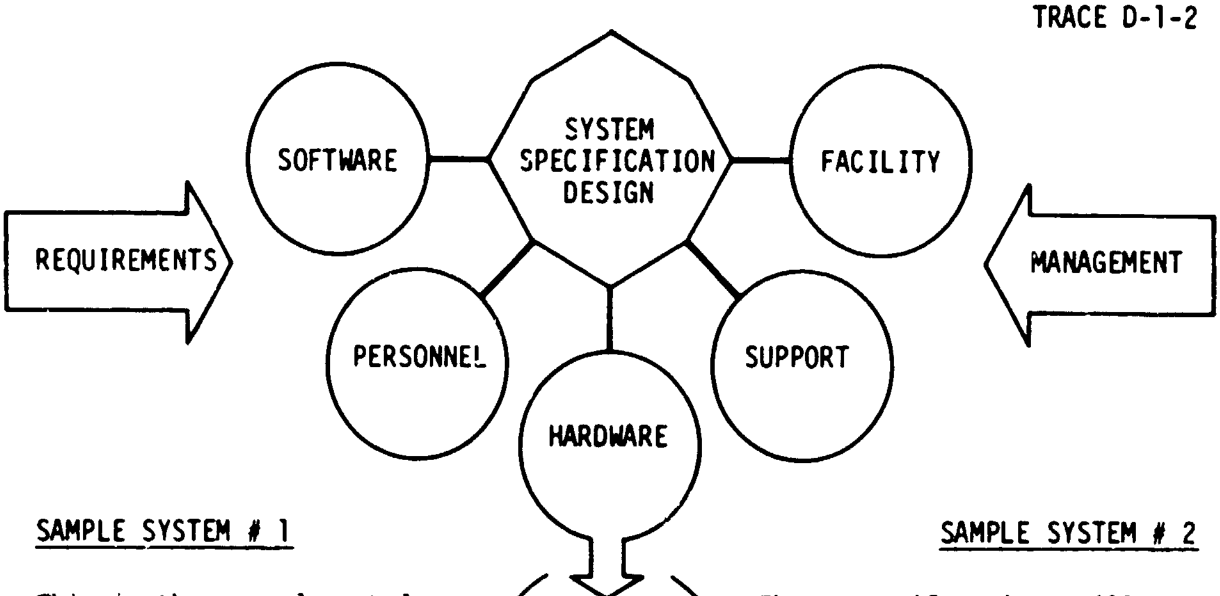
This is one of the two most detailed steps in this sample system. The on-line console must be specified for procurement at this point. Its performance and physical characteristics should be described as a part of the system specification design.

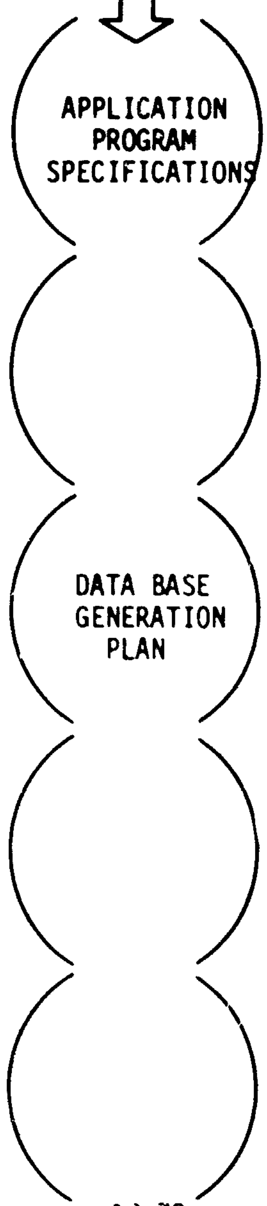
This will not be applicable for this sample system since it is assumed that an existing computer and its system software is directed for use. Hardware elements connected with this system are not affected by this step.

SAMPLE SYSTEM # 2

The many hardware elements for this system must be organized by functional area and specified for procurement and for development at this point. The performance and physical characteristics of each item should be documented for acquisition purposes. This is normally a large, time-consuming step for a system such as this. It is important to have experienced engineering personnel involved in the preparation of these specifications.

The specifications for system software will affect the data processing mass storage and computer memory size requirements. It will also affect the message switching hardware-buffer aspects if the data processing concept contains many remote, on-line terminals.





SAMPLE SYSTEM # 1

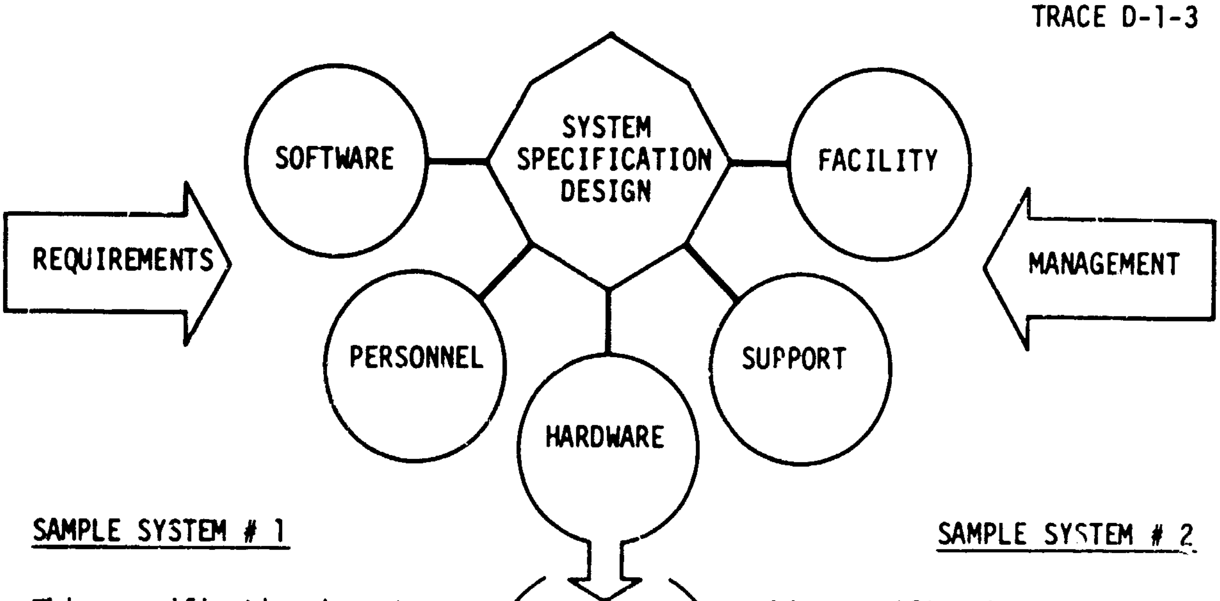
This is the second most detailed specification step to be developed in this system. The programs needed must reflect the data flow and the man-machine interaction determined valid in the System Concept Design Task. A re-validation of hardware specifications occurs here.

Since there is no existing data base, a generation plan to establish a data base is necessary. This plan should make up part of the system specification so that the effort can be started. No hardware will be affected by this step unless the on-line console to be installed in the future is to be used for this activity.

SAMPLE SYSTEM # 2

These specifications will require close coordination with the on-line terminal hardware specifications as applicable to all operator positions within the system.

This plan will not affect the hardware elements of the system specification except to a minor degree. The future on-line terminals may be used for data base generation.



FILE MANAGEMENT SYSTEM SPECIFICATION

SAMPLE SYSTEM # 1

This specification is not necessary since the existing file management system for a given computer is to be used for sample system # 1.

SAMPLE SYSTEM # 2

This specification step will not affect the hardware elements after basic data base design has been accomplished in the previous step under the System Concept Design Task.

FUNCTIONAL EQUIPMENT CRITERIA

SAMPLE SYSTEM # 1

No other equipments except the on-line display consol^ will be functional items as far as man-machine activity is concerned. The criteria for its configuration will be similar to this hardware element's characteristics which were determined in a previous step within this task.

SAMPLE SYSTEM # 2

Many functional equipments will be included in the mission analysis system. Each hardware specification will have to be tailored by the operating criteria established for that item's use. This should be reviewed at this point as the specifications are being prepared.

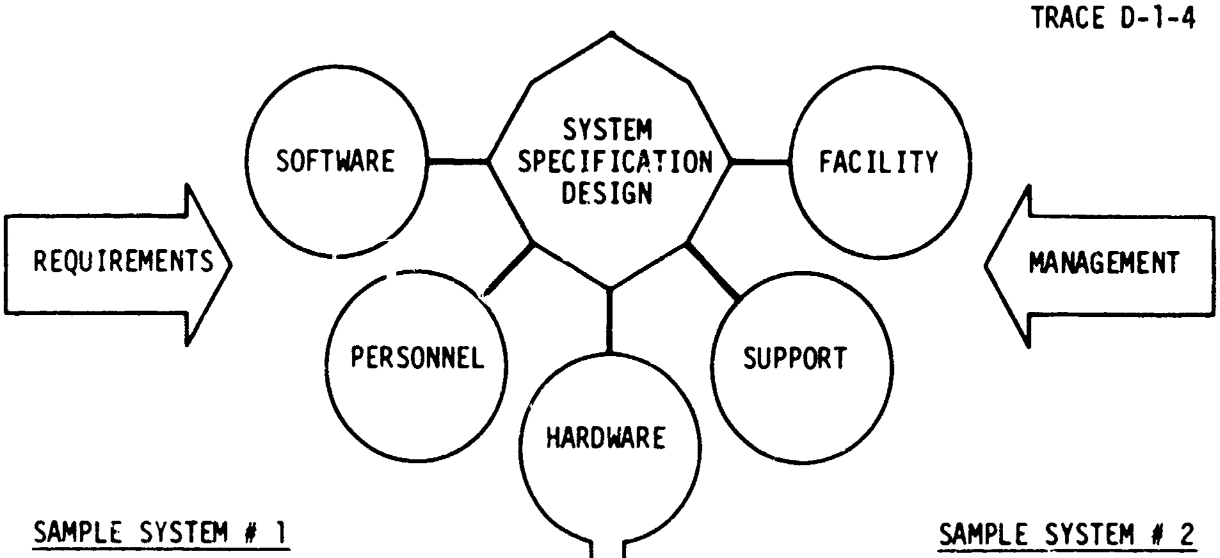
FACILITY PLAN

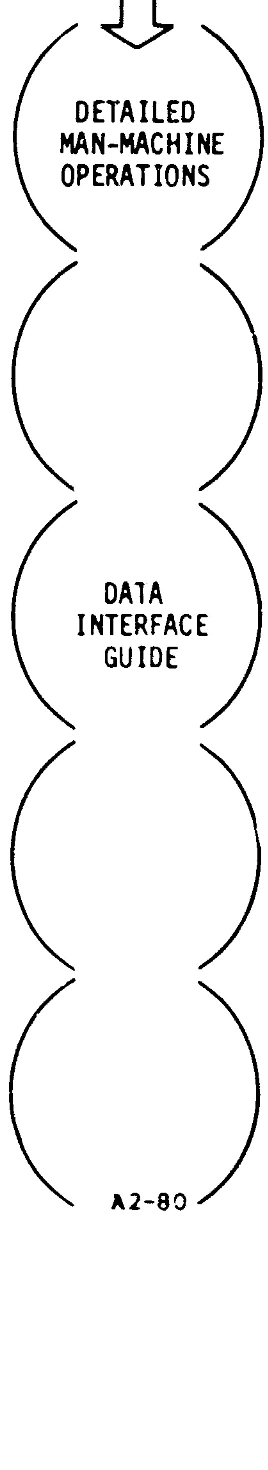
SAMPLE SYSTEM # 1

This step will not affect the hardware element specifications for sample system # 1.

SAMPLE SYSTEM # 2

The facility plan should be illustrated and described as part of the system specification. The hardware elements should be reviewed to assure that their physical characteristics will be compatible with current facility plans.





SAMPLE SYSTEM # 1

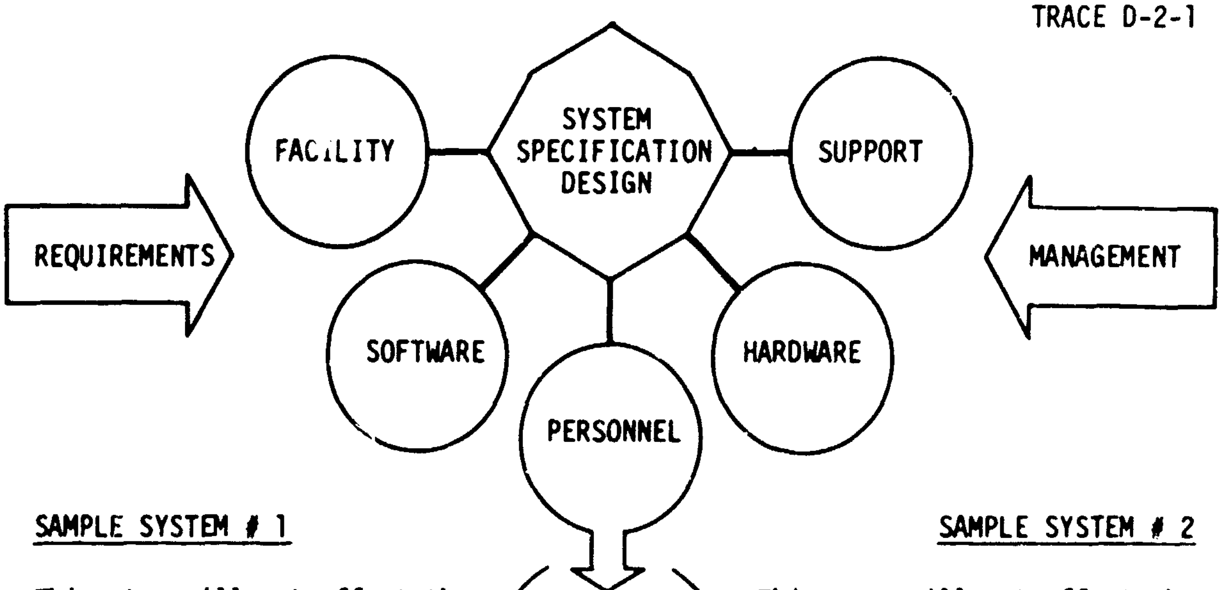
These operations will be reflected in the keyboard and control switch components of the display console. All possible man-machine operations should be reviewed at this time to lend confidence to the completeness of the hardware portion of the system specification.

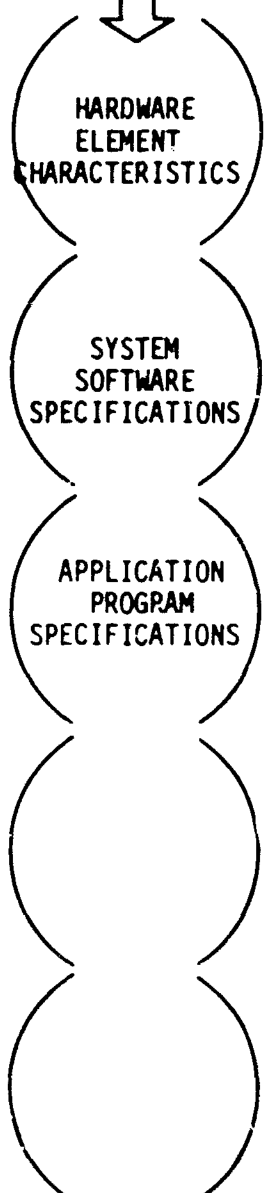
This step is not applicable for this system as far as the hardware elements are concerned.

SAMPLE SYSTEM # 2

A review and completion of detailed man-machine data flows must be performed at this stage of hardware specification. This is another area where user coordination is necessary and most helpful for aiding in future testing and acceptance.

The hardware station data input and output formats must be reviewed for each hardware element. This will assure that the previously developed data flow and system concept can be implemented from a hardware standpoint. This step also requires close coordination with the user and all hardware element groups involved in specific hardware specifications.





SAMPLE SYSTEM # 1

This step will not affect the personnel plans significantly in sample system # 1.

This step will not affect the personnel elements for this sample system specification.

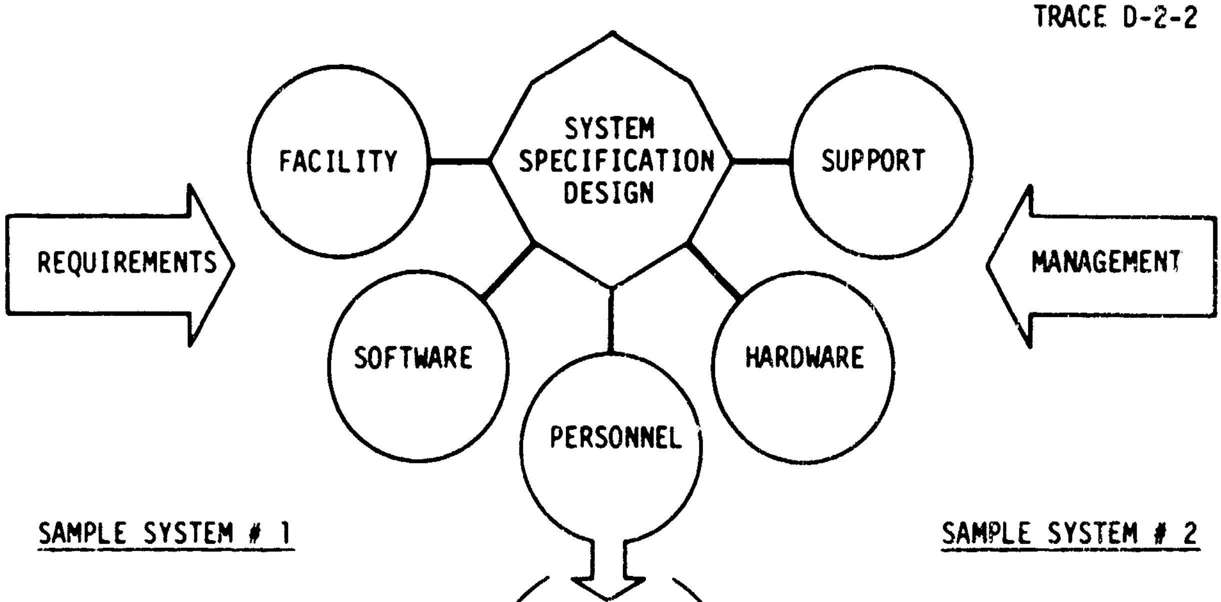
This step will not affect the personnel elements for this sample system specification.

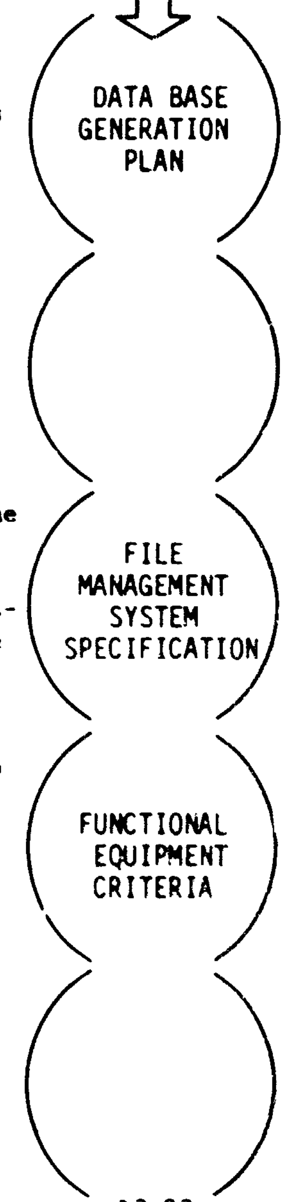
SAMPLE SYSTEM # 2

This step will not affect the personnel specification elements except to help validate critical training requirements previously identified.

This will not affect the personnel elements at this point in the system analysis effort.

This will not affect the personnel acquisition planning directly; however, as the application programming language is defined at this point, it should be reflected in personnel training plans. These items are considered as support elements in this sample system.





SAMPLE SYSTEM # 1

This step will identify the schedule, number of staff members, and their locations as required to generate the operational files that will make up the data base for use by the infrared report editor.

This step will not affect the personnel elements of this sample system, because an existing file management system is to be used for sample system # 1.

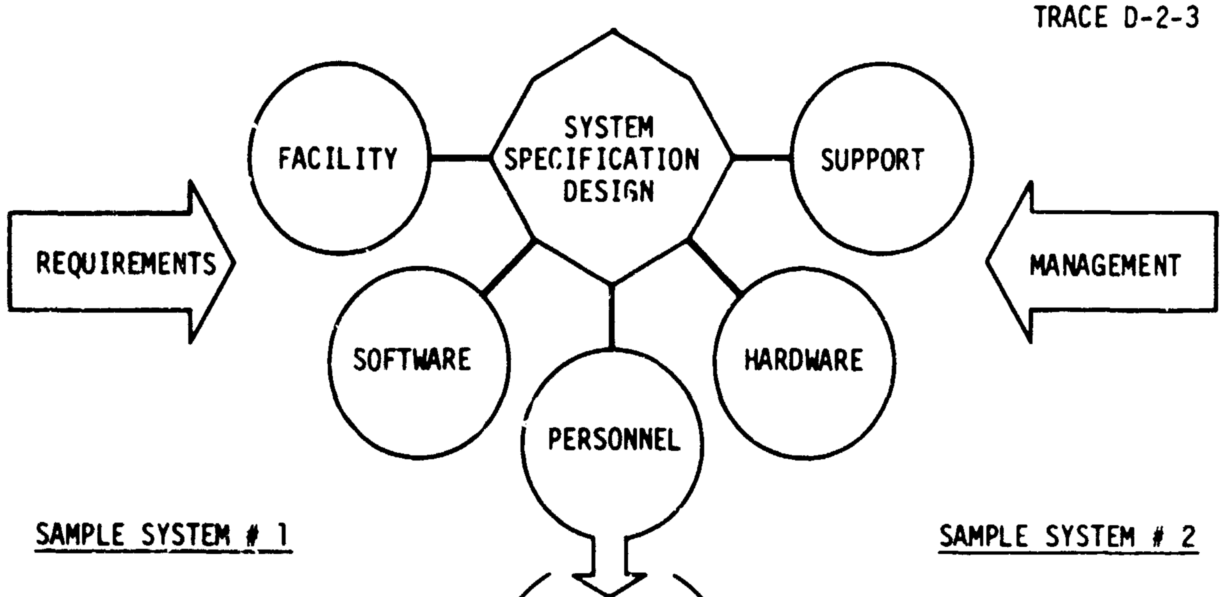
The personnel elements will not be affected by this step at this point in the system analysis.

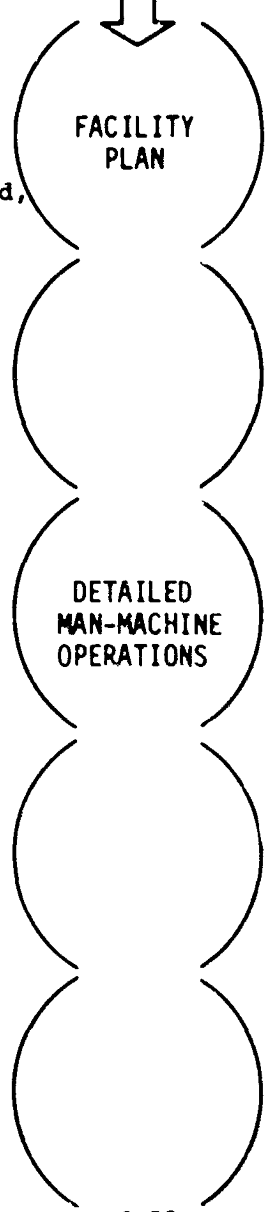
SAMPLE SYSTEM # 2

This will also identify the schedule, number of staff members, and their locations for generating the data base. This is a significant step at this point for a large system where multiple formatted data comprises the data base.

This has no effect on the personnel elements included in the System Specification Task.

The many types of special purpose equipment to be operated requires that all equipment criteria reflected in the hardware element specifications be reviewed for their impact on personnel planning. Dangerous equipment, continuously operating equipments, equipments to be used in darkrooms, etc., all affect personnel elements to be documented in the system specification.





SAMPLE SYSTEM # 1

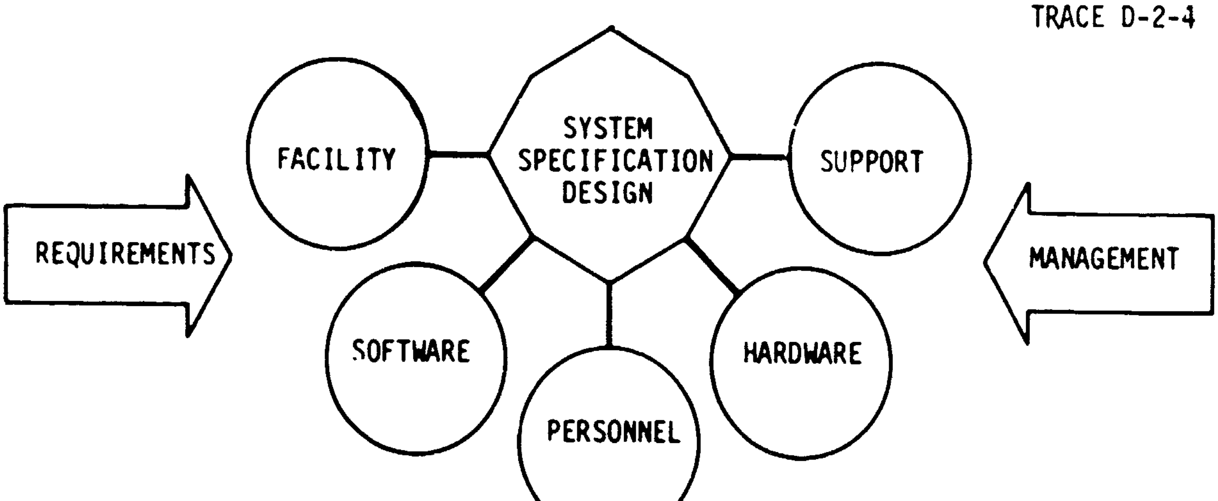
This will validate the proposed work area and location so that administrative procedures that affect the system operators can be developed, i.e., future demonstrations, personnel communication accommodations, etc.

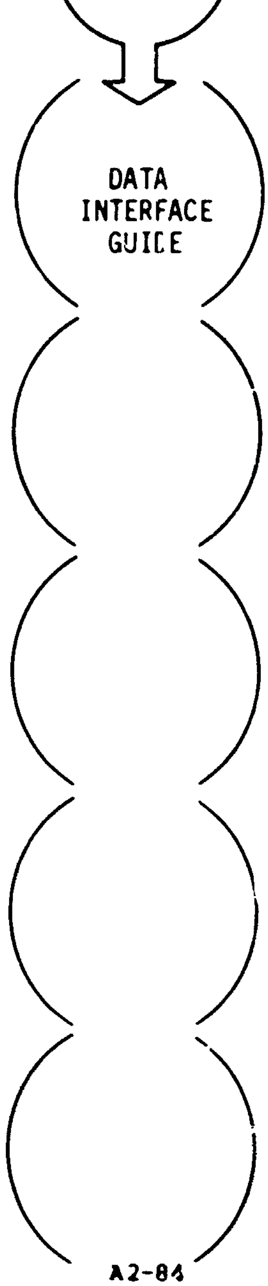
This step will re-confirm the training needed and any special reference data required by the operator at the CRT display console station. It will not impact on the personnel elements portion of the system specifications to any great degree.

SAMPLE SYSTEM # 2

This step will validate that working space has been properly allocated for the man-machine station configurations and it is important to have this data at this time. Coordination with the user is helpful here.

This will re-confirm the training and numbers of personnel needed throughout the system. This is the final check on detailed manning requests to be included in the system specification.



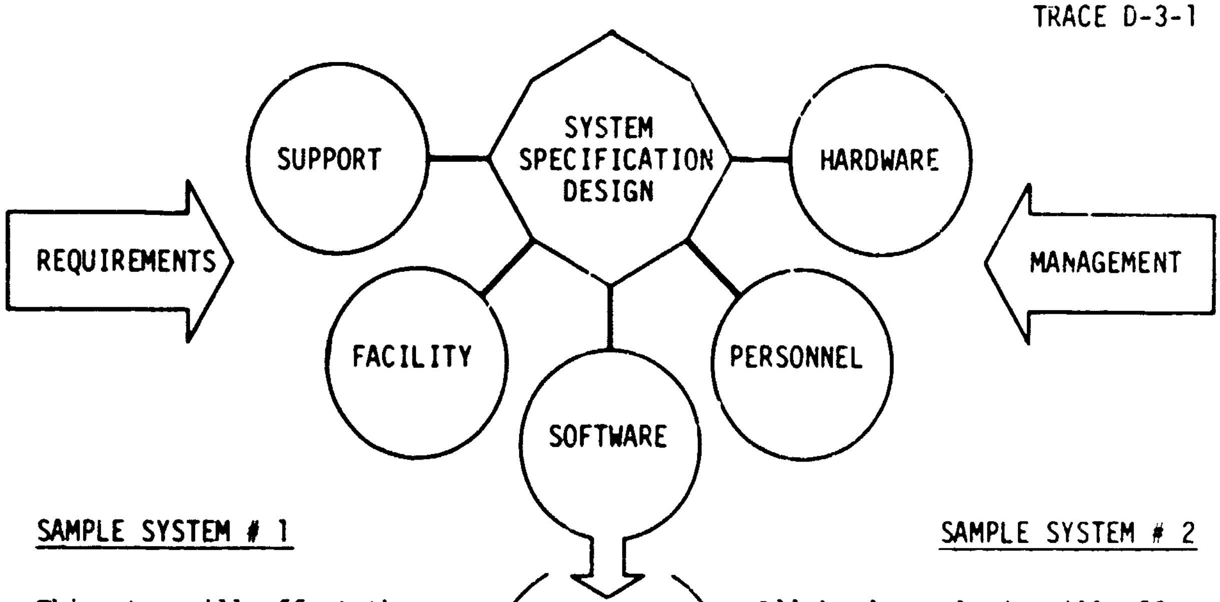


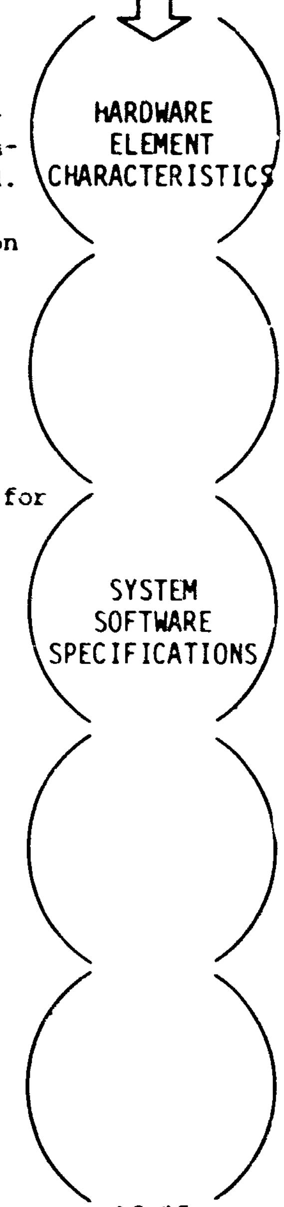
SAMPLE SYSTEM # 1

This step will only help assure the system analyst that the input/output procedures are properly included in the personnel training plans for sample system # 1.

SAMPLE SYSTEM # 2

Since many different formats of data will be handled within this system, this step will define the manual data transfer methods affecting personnel procedures. These standard operating procedures should be drafted in the System Specification Task to facilitate the Baseline Implementation Task.





SAMPLE SYSTEM # 1

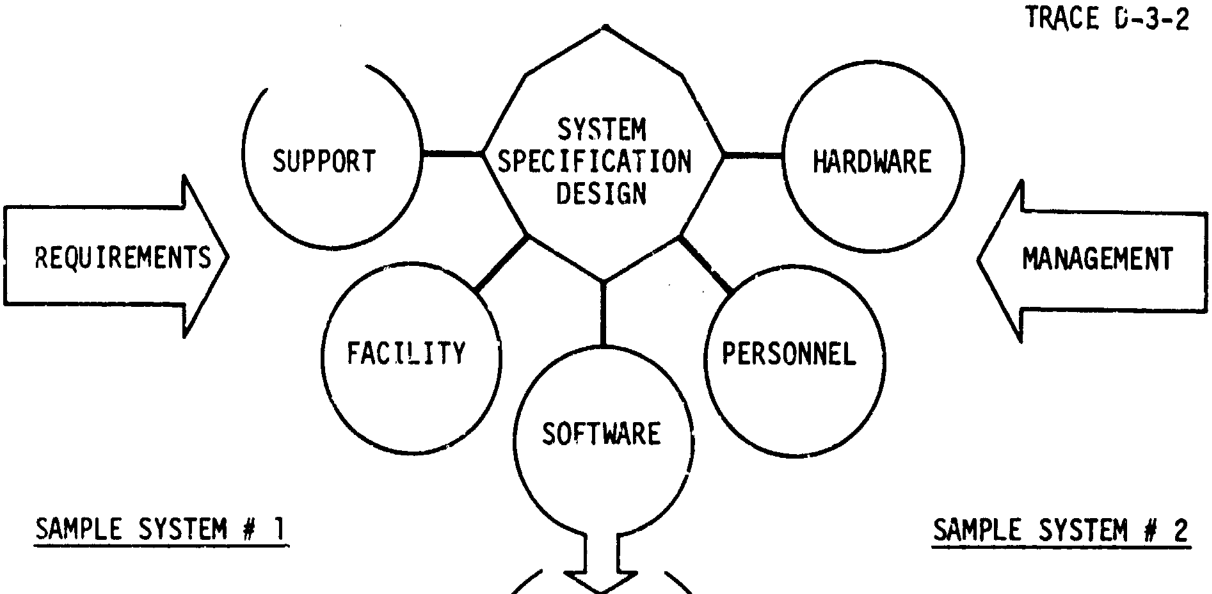
This step will affect the software elements to the extent that the characteristics of the console electronics are completely specified. This will determine the bit configuration for application programming specifications.

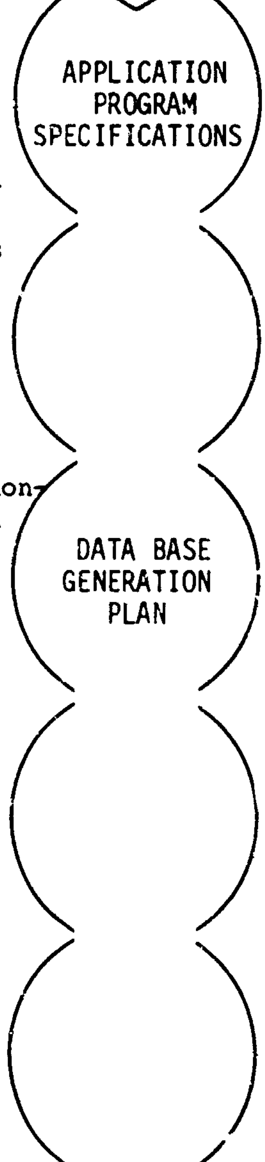
This step is not applicable for sample system # 1.

SAMPLE SYSTEM # 2

All hardware logic will affect the software interfaces between peripheral equipments and the data processing component(s) used. This will be an important step to complete prior to drafting the software portion of the system specifications.

This is a significant step for this system and is a major portion of the software portion of the system specification. Executive, utility, standard conversion, display library handlers, diagnostic, and system initiation programs must be defined and flowcharted at this time.





SAMPLE SYSTEM # 1

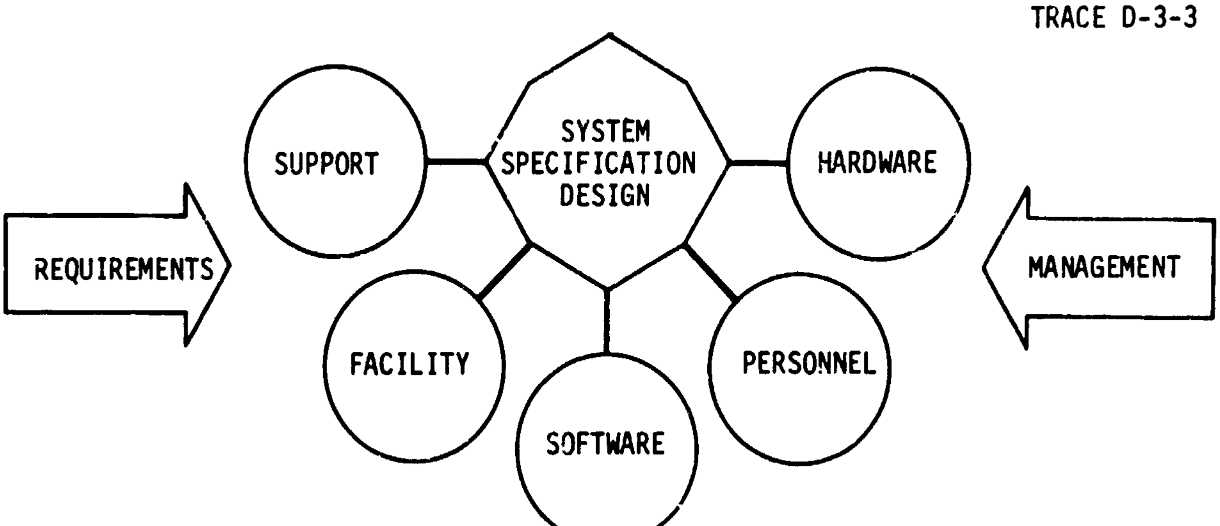
This is an important step at this point and sums up the programming to be done in support of the on-line console station being developed or procured. This specification should be detailed to gross flowchart level at this point.

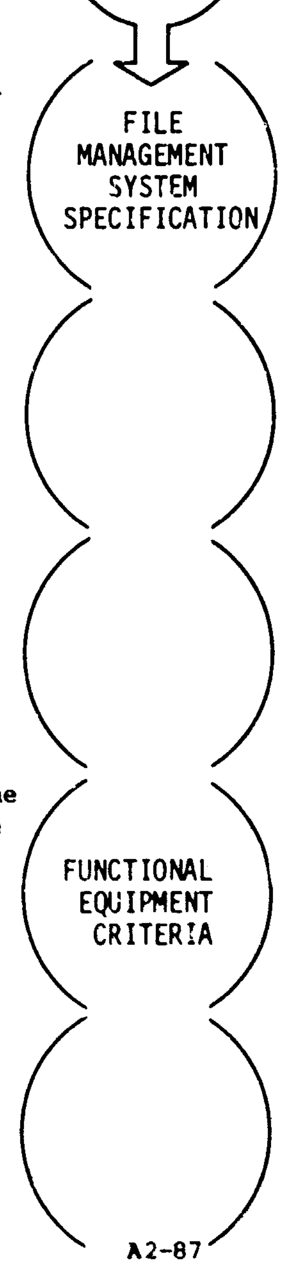
This plan may identify additional or interim programs needed in the computer component to assist in the file creation task prior to actual operation.

SAMPLE SYSTEM # 2

This is also a significant step in the system specification task. Major application programs must be initially flowcharted and functionally described for further implementation. This is a step that should be performed by experienced personnel, because imagination and hardware knowledge are needed here as well as program logic experience.

In this system the data base generation effort will require programs to allow existing data files to be converted to the newly defined computer file structure. This portion of the specification is relatively important to detail at this time so that work can begin in the near future.





SAMPLE SYSTEM # 1

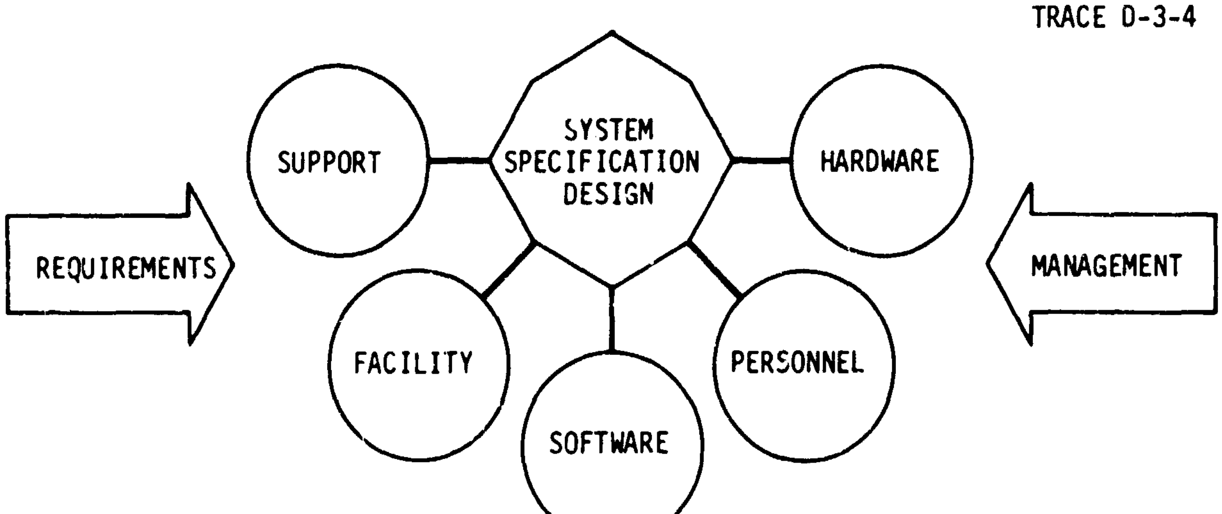
This step will not be applicable for sample system # 1.

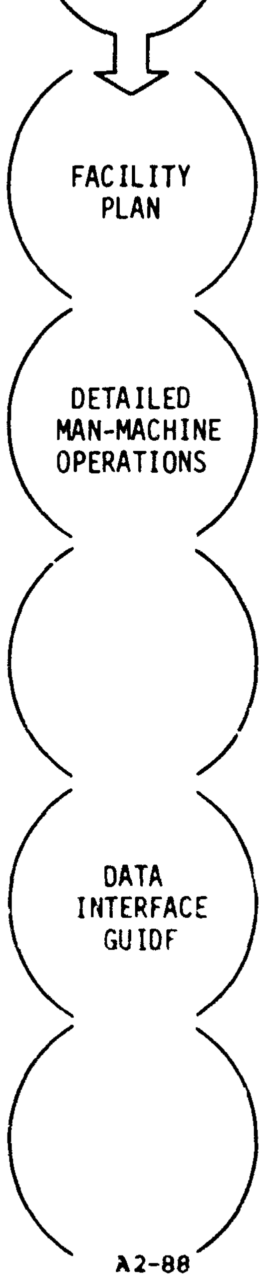
This step will not affect the software elements for sample system # 1.

SAMPLE SYSTEM # 2

This is a very significant step relative to the software elements in the system specification. Coordination must take place between those preparing application program specifications and this area of design. This specification should be described relative to the data elements to be handled at each work station using on-line support, and a language should be defined for the programs to be generated in this area.

Data input requirements and output data formats from equipments that are not directly connected on-line to the computer component(s) or that are directly connected must be reviewed for the effects on data conversion programs needed throughout this system. This is an important step in pinpointing internal data interfaces.





SAMPLE SYSTEM # 1

This step will not affect the software elements for sample system # 1.

This step will re-validate application software specifications needed to implement operating procedures.

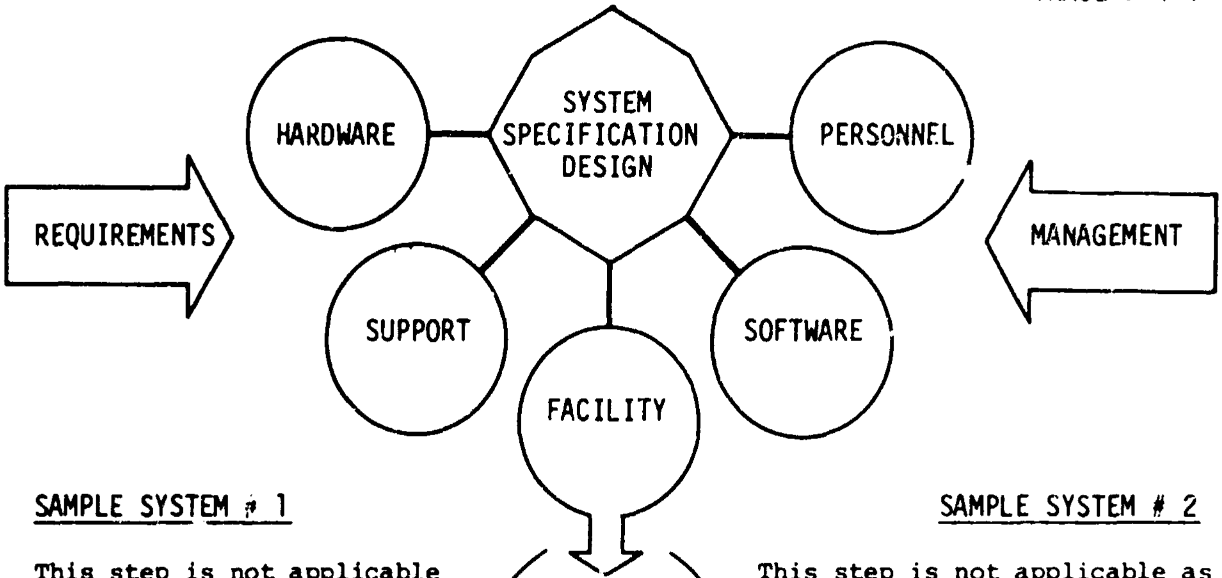
The digital data conversion necessary between the console and the computer components should be examined here, and the application software should include any such capability needed.

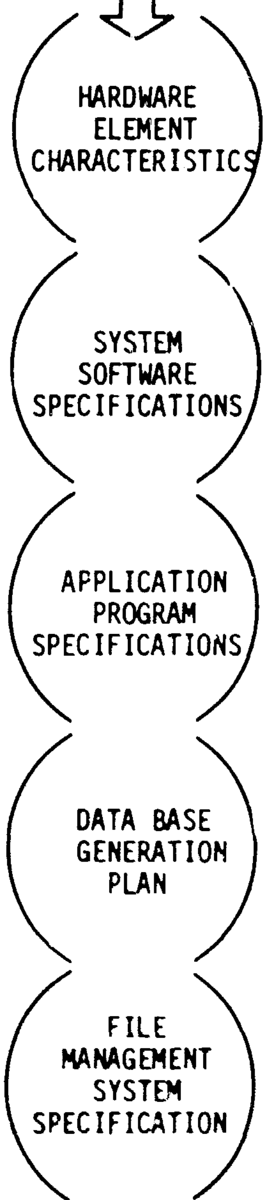
SAMPLE SYSTEM # 2

This step has no effect on the software elements in the System Specification Design Task.

This step helps validate the application programs and is one of the methods by which the system analyst and his management personnel can effect coordination on application programs between the user and the developers of the system.

This is a more detailed review and recording of the internal and external data exchange actions to be characteristic of the system being specified. This is the vehicle by which user inter-organizational coordination can be accomplished relative to data base and product information.





SAMPLE SYSTEM # 1

This step is not applicable as far as facility elements are concerned for sample system # 1.

This step is not applicable as far as facility elements are concerned for sample system # 1.

This step is not applicable as far as facility elements are concerned for sample system # 1.

This step is not applicable as far as facility elements are concerned for sample system # 1.

This step is not applicable as far as facility elements are concerned for sample system # 1.

SAMPLE SYSTEM # 2

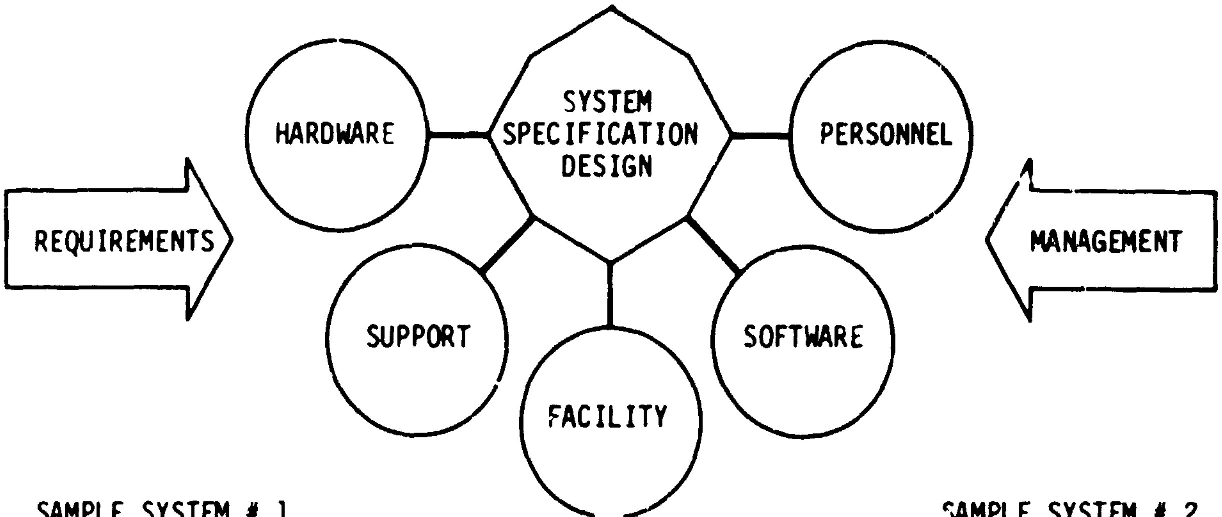
This step is not applicable as far as facility elements are concerned for sample system #2.

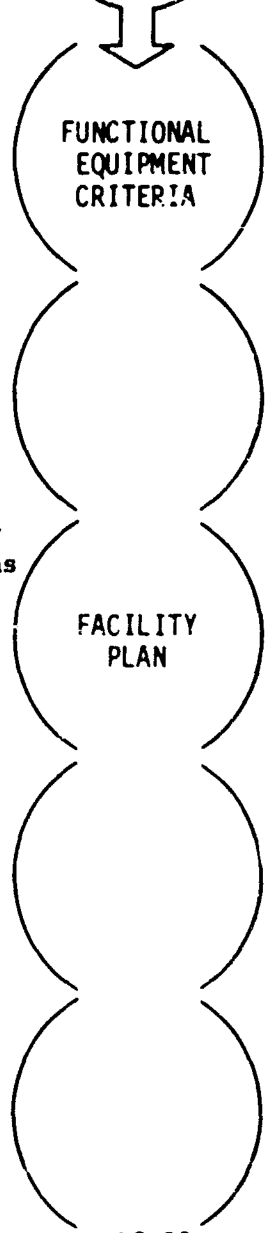
This step is not applicable as far as facility elements are concerned for sample system # 2.

This step is not applicable as far as facility elements are concerned for sample system # 2.

This step is not applicable as far as facility elements are concerned for sample system # 2.

This step is not applicable as far as facility elements are concerned for sample system # 2.





SAMPLE SYSTEM # 1

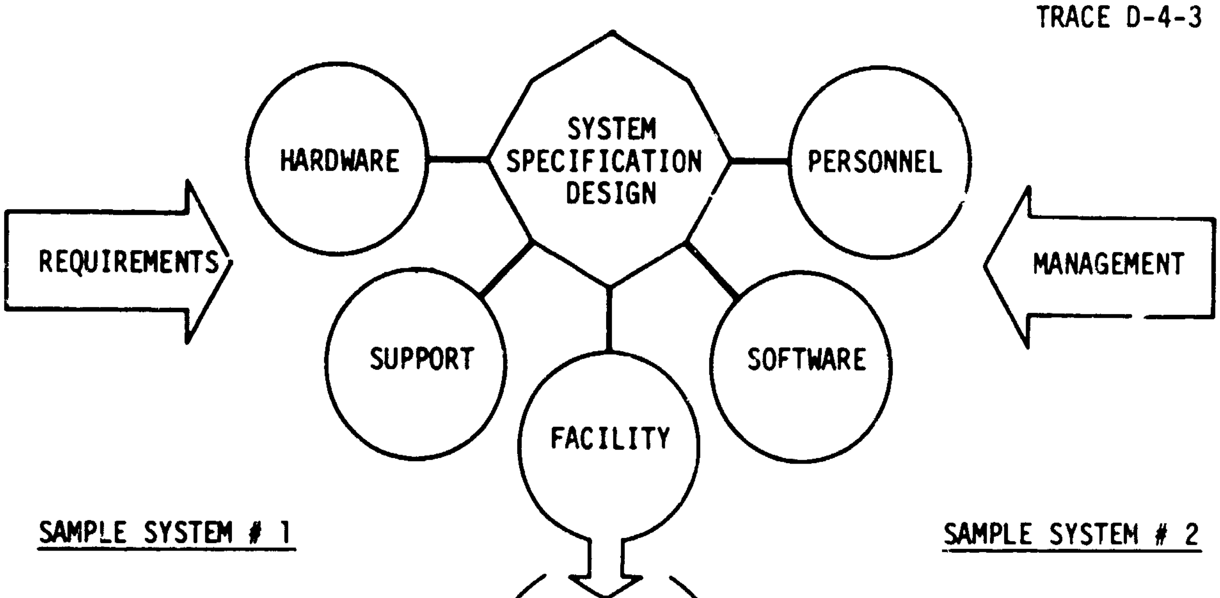
If factors such as electrical shielding or vibration isolation criteria are necessary for the operation of the display console, the facility elements might be affected .

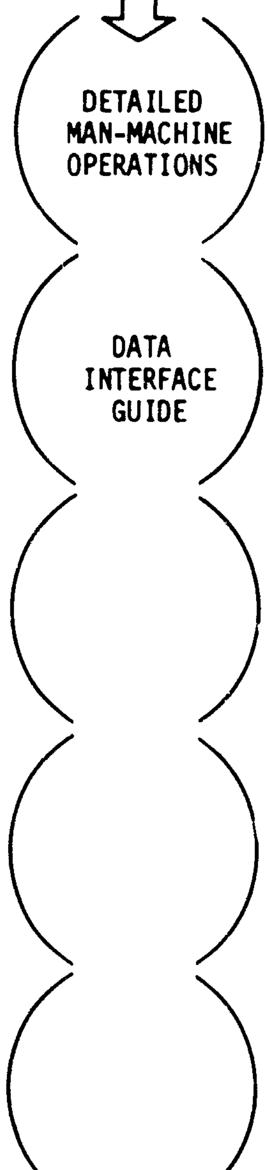
This step is the main summary of all work area modifications to be done in preparation for the CRT display station in sample system # 1.

SAMPLE SYSTEM # 2

This step provides a check on the facility plan relative to the unique characteristics of each hardware item located at specific points in the facility. Shielding, vibration isolation, noise abatement, dust control, lighting conditions, etc., if affecting equipment operation, should be reflected in the facility specifications at this point.

This is a summary of all facility construction or modification specifications and the procedure by which these specifications will be implemented and when. This step is important to perform at this time in order to proceed with the Baseline Implementation Task.





SAMPLE SYSTEM # 1

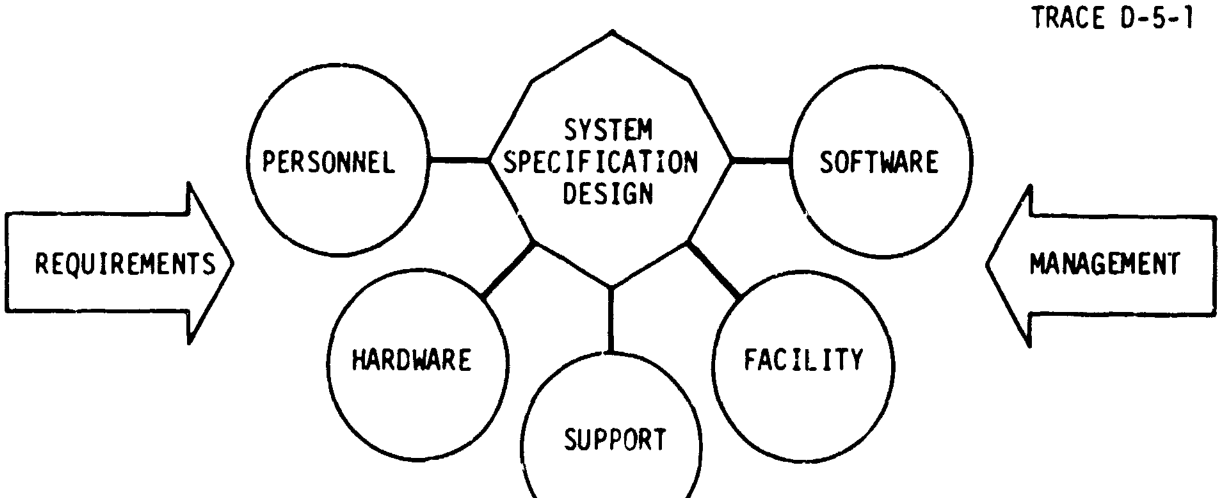
This step is not applicable as far as facility elements are concerned for sample system # 1.

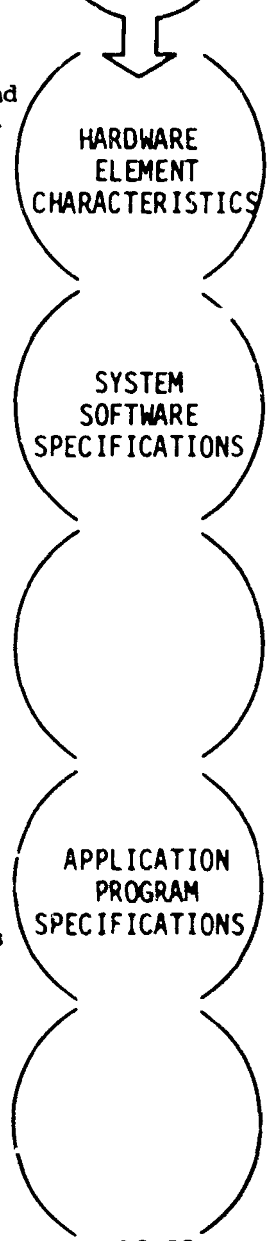
This step is not applicable as far as facility elements are concerned for sample system #1.

SAMPLE SYSTEM # 2

This provides a final check on man-machine stations as previously conceived.

This provides a review of the cable connections between equipments and the manual movement requirements which impact on facility design factors. This is an excellent point to have user coordination on facility details as related to operational needs.





SAMPLE SYSTEM # 1

Spare parts, supply needs, and maintenance support are identified for the CRT display console and reflected in the procurement specifications.

This step is not applicable for sample system # 1.

Supplies, supplemental programming aids, and reference documentation may be needed for the application programmer, and this can be derived by examing the specifications for the application programs to be developed.

SAMPLE SYSTEM # 2

The different hardware items in this system must be reviewed at this point so that spare parts, supplies, maintenance, and support documentation can be specified for each nardware element.

Supplies and the necessary housekeeping needs for the staff and length of time planned for producing all system software in-house should be specified. If it is to be contracted out, then the direct support needed to be provided may be reduced dependent on the location selected for this activity.

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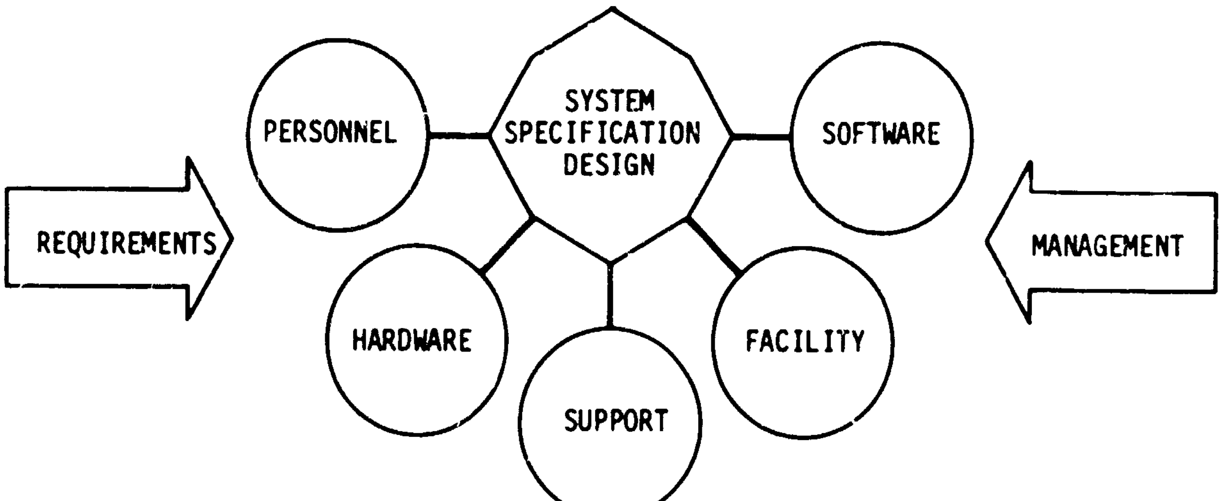


DATA BASE GENERATION PLAN

SAMPLE SYSTEM # 1

Any temporary space or supply elements required while generating the data base can be derived at this time and specified in the support area of the system specification.

SAMPLE SYSTEM # 2

Supplies and the necessary housekeeping needs for the staff and length of time planned for producing all system software in-house should be specified. If it is to be contracted out, then the direct support needed to be provided may be reduced dependent on the location selected for this activity.

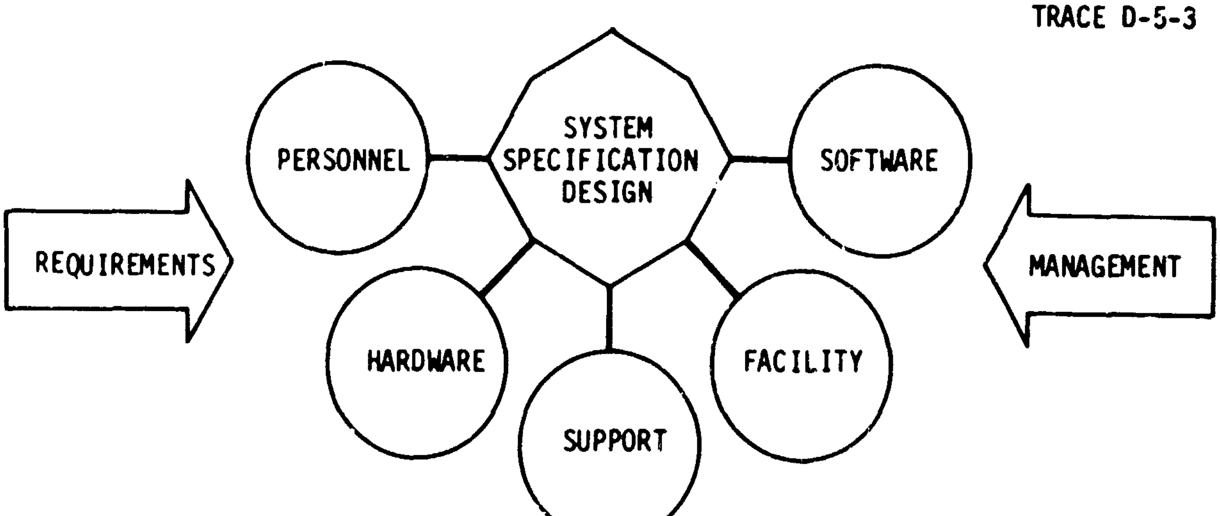
FILE MANAGEMENT SYSTEM SPECIFICATION

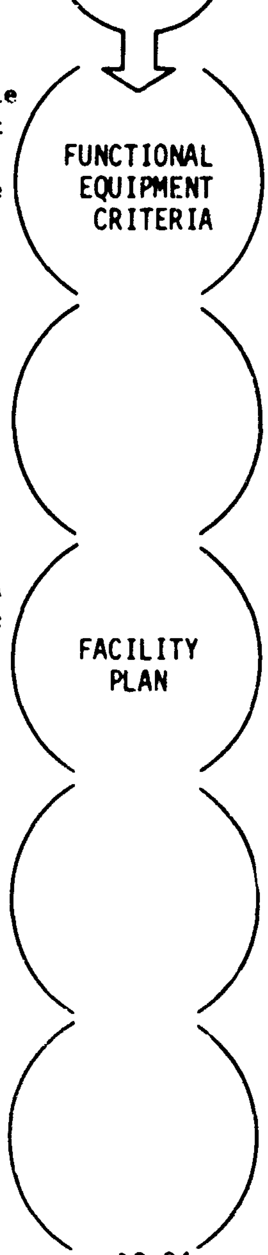
SAMPLE SYSTEM # 1

This step is not applicable for sample system # 1.

SAMPLE SYSTEM # 2

Supplies and the necessary housekeeping needs for the staff and length of time planned for producing all system software in-house should be specified. If it is to be contracted out, then the direct support needed to be provided may be reduced dependent on the location selected for this activity.





SAMPLE SYSTEM # 1

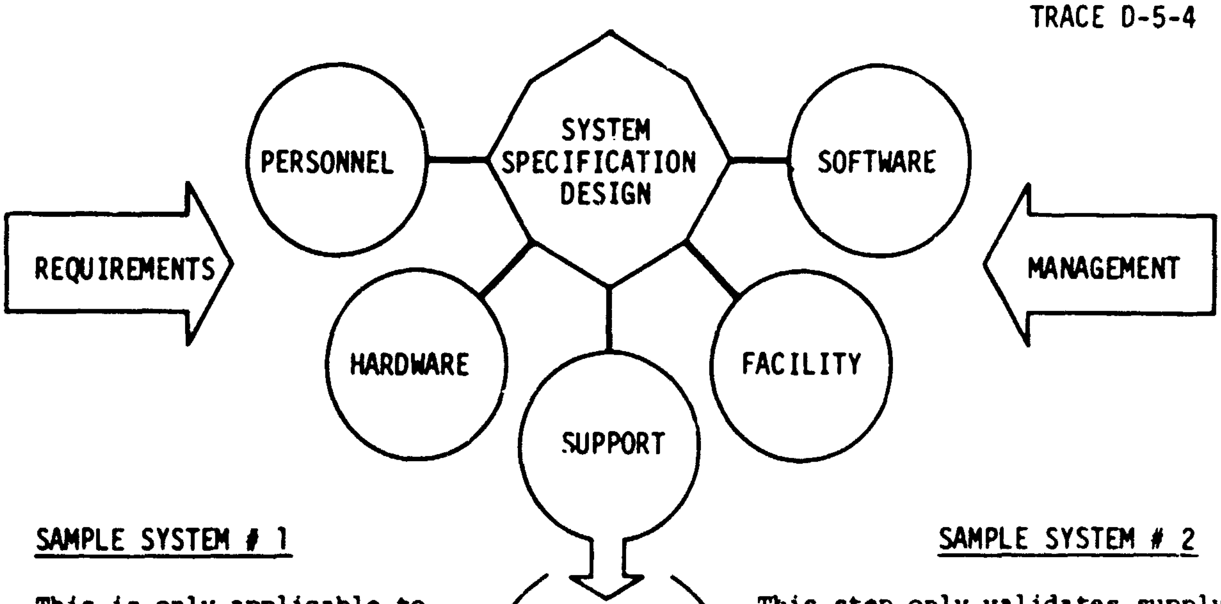
Since only one display console is involved, this step is not applicable to defining further support needs for sample system # 1.

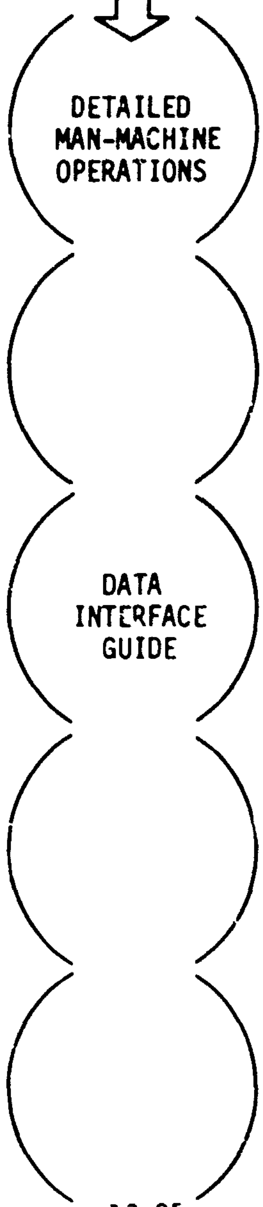
Any modification planned for the console work station area may require parts or periodic inspections which should be specified at this time.

SAMPLE SYSTEM # 2

Miscellaneous supplies and services such as inspections, safety equipment, distilled water or movable heaters, etc., should be considered as support elements and will be governed by the criteria under which the equipment is expected to function, tailored by the self-contained features of each hardware item specified earlier.

This step is important in a large system analysis effort so that an appreciation for operating and maintaining a new facility can be developed. Heating, lighting, janitorial, and other future costs must be derived here for coordination with users who must budget for these elements.





SAMPLE SYSTEM # 1

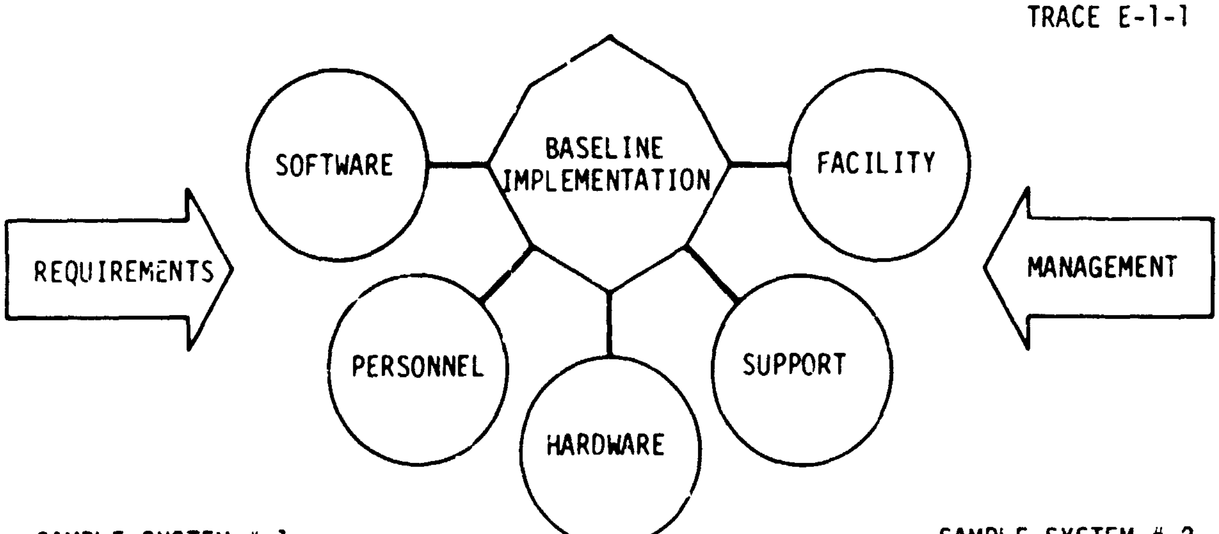
This is only applicable to validate the supply requirements at the console station in support of normal operational activity.

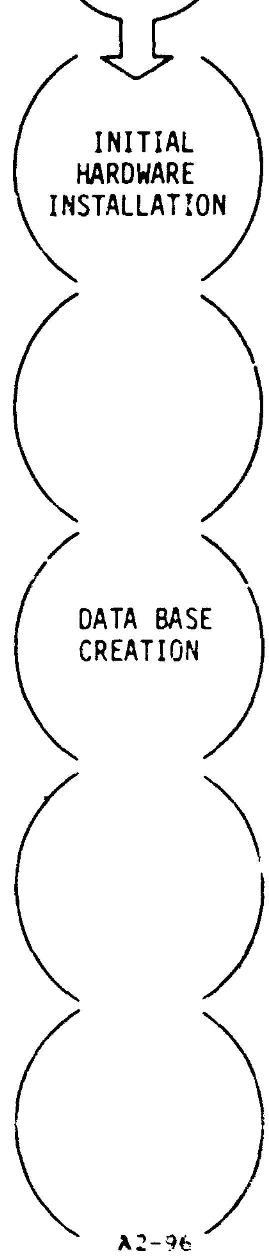
This step is not applicable as far as support elements are concerned for subsystem # 1.

SAMPLE SYSTEM # 2

This step only validates supply and reference documentation needed at the various man-machine stations, but for a large system such as this, it is necessary to specify so these elements can be acquired for the Baseline Exercising Task.

A significant amount of internal and external interface will be required. Inter-command support for supplies, training, contractor support services, etc., dictates that this be performed as an important part of this system and made a part of the System Specification Design.





SAMPLE SYSTEM # 1

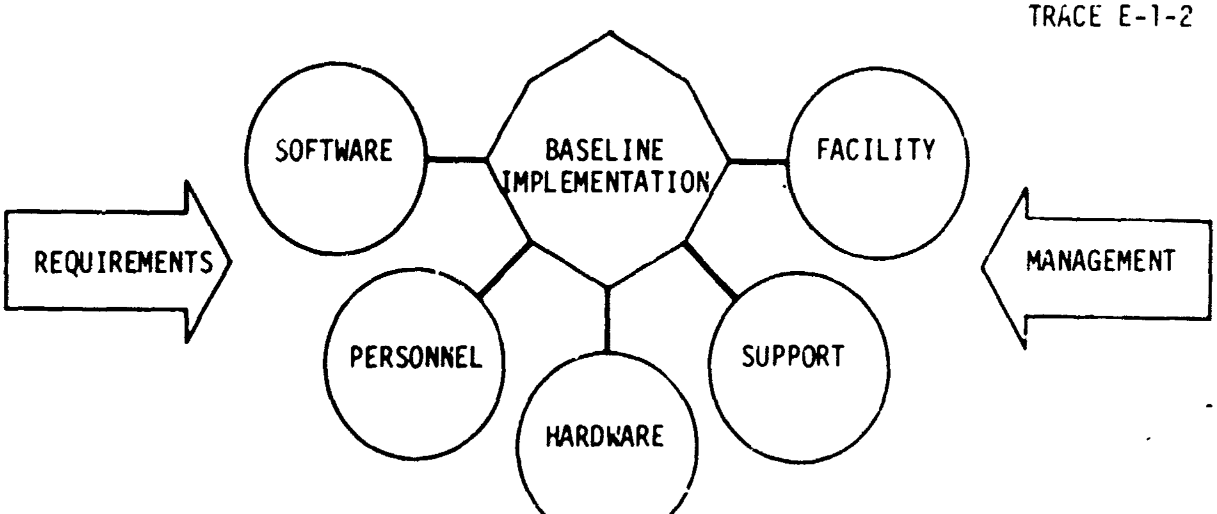
Only the one on-line CRT display console must be installed and checked for performance compliance in sample system #1.

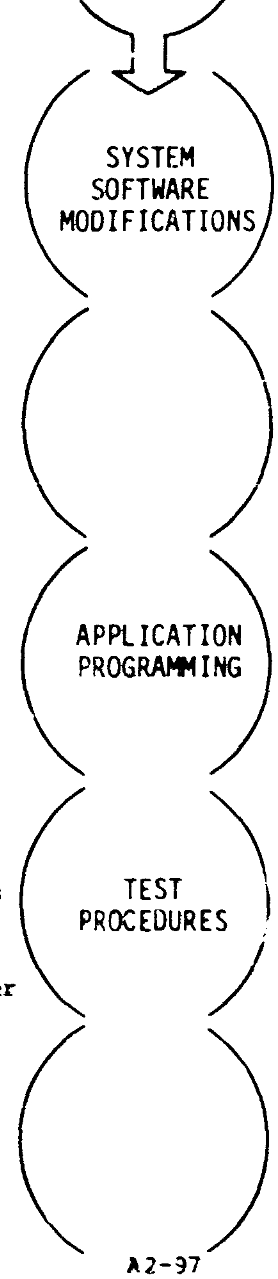
The initial set of working files for use with the display console must be loaded through the newly installed console or via other I/O methods in the computer complex to which the console is connected.

SAMPLE SYSTEM # 2

Many hardware items should be installed in functional groups. Th on-line terminals to support each functional area should be installed as soon as possible to allow electrical interfacing and application programming to progress. The key input and output area equipments that are not on-line to a computer should be installed early to provide experience with the different data formats and hardware controls.

This will be a significant portion of the baseline system implementation effort. Hard-copy items, digital files, working indexes, and up-to-date data base reference documentation are necessary items that must be produced. The on-line equipments should be used as soon as possible in this task for experience and system concept validation purposes.





SAMPLE SYSTEM # 1

This step is not applicable for sample system #1.

This step will require use of the new console for program checkout as soon as possible after the application programs are coded and loaded into the computer complex.

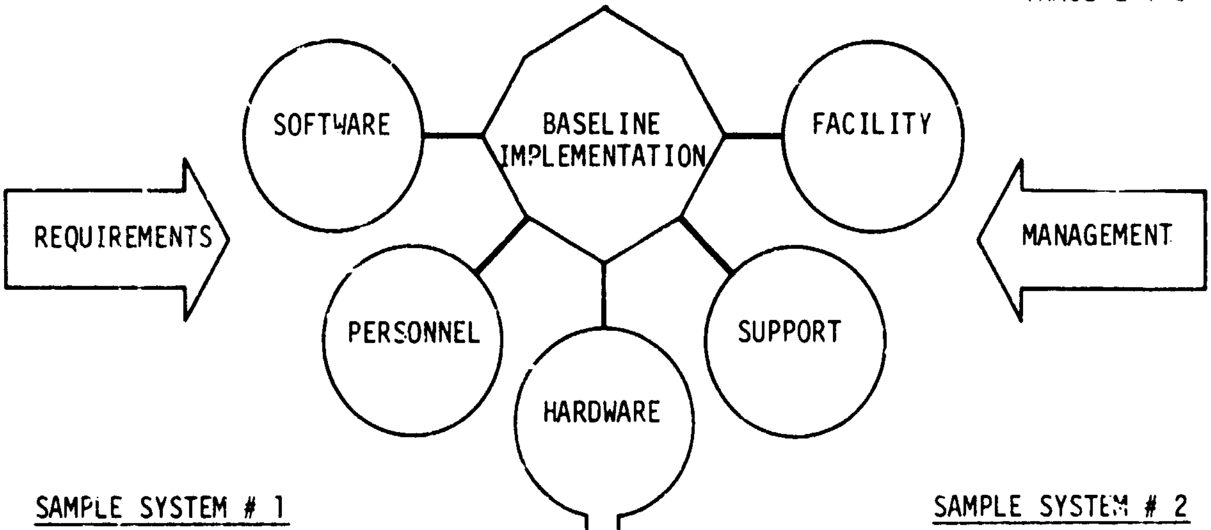
These procedures must be prepared so as to exercise all the performance features specified in the hardware specifications as listed in reports describing earlier man-machine interaction.

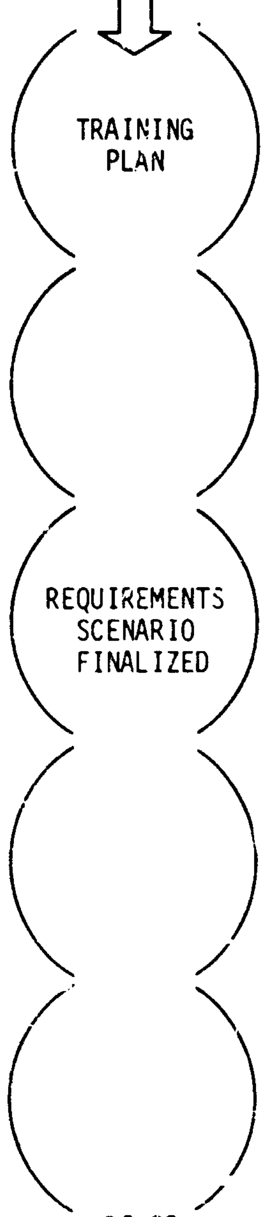
SAMPLE SYSTEM # 2

This step has a relationship to the availability of data processing equipment. If the system's hardware is not going to be available right after the System Specification Design Task, then a similar EDP system can sometimes be used (usually at more expense and with data security limitations) to save time.

The data processing hardware configuration along with exact copies of the terminal equipments must be available to the programmers for this activity to be efficiently accomplished.

All hardware must be exercised against a pre-planned test to assure their compliance to specifications. Many of the detailed man-machine test procedures should be developed after the hardware is installed in this type of system. Close coordination during equipment design and fabrication can provide some data for this step, but as a rule much must be done after actual installation.





SAMPLE SYSTEM # 1

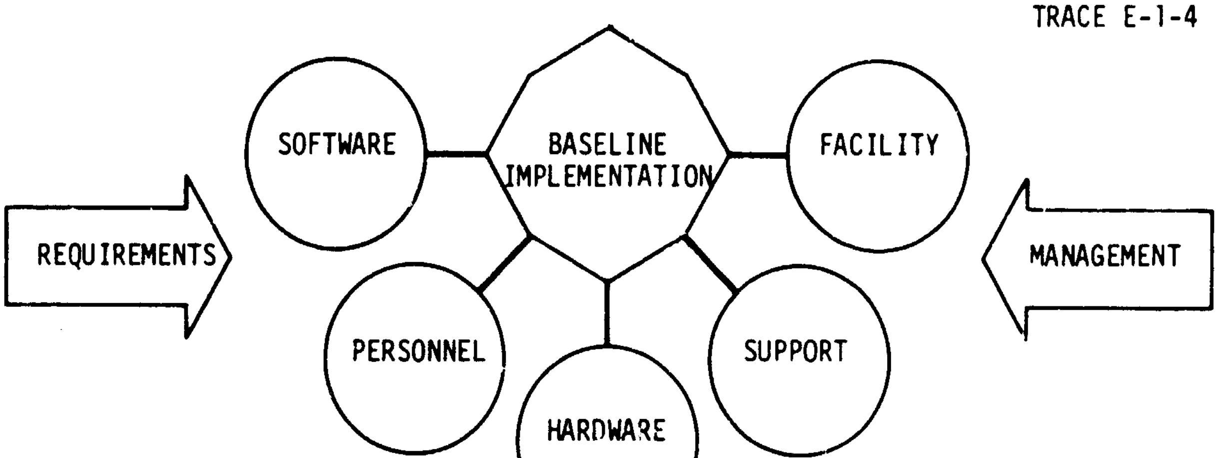
This will be a minor step for sample system #1 since on-the-job training will be relatively minor. No hardware elements will be affected in this case.

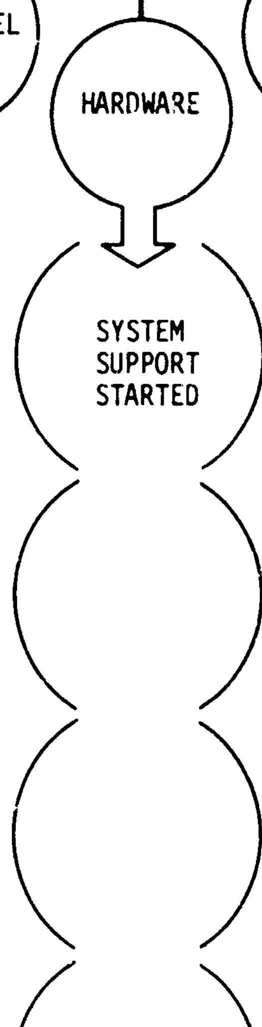
A careful review of the scenario will assist in test planning which will in turn assist in future hardware testing.

SAMPLE SYSTEM # 2

The training plans for each hardware element should be developed during the hardware's fabrication. Complex hardware that is of new design needs the support of the design or prototype fabrication engineer in this step. Effort spent here will help transition the hardware more easily through the Operational Acceptance Test.

This step must be fully detailed in order to complete the test plans and data base creation steps. This effort is the "single-thread" needed to demonstrate the system's hardware separately as well as in an integrated manner later in the Baseline System Exercising Task.



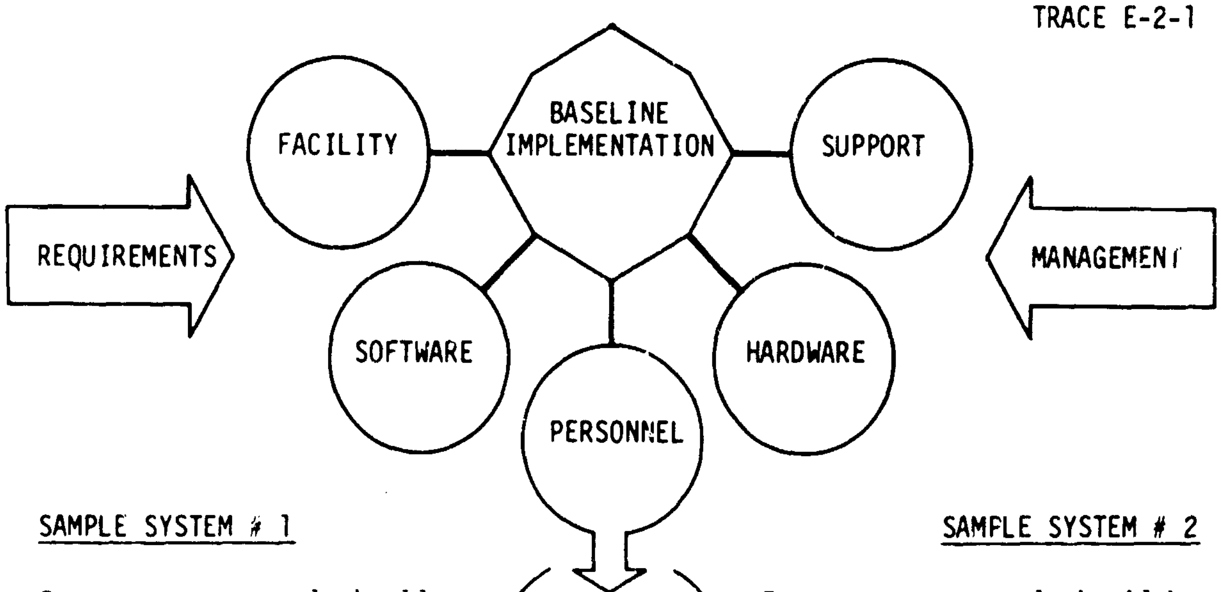


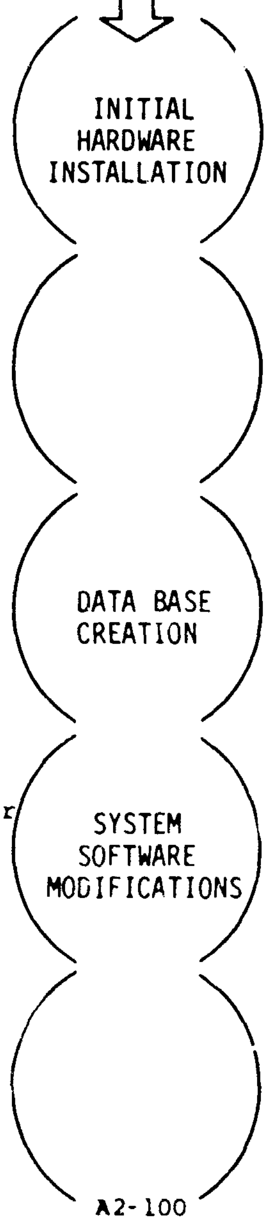
SAMPLE SYSTEM # 1

An initial stock of spare parts and supplies are needed at console delivery time. Continual on-site maintenance is usually necessary through this period for non-production line hardware items.

SAMPLE SYSTEM # 2

As soon as any hardware is installed, spare parts, supplies, maintenance, and reference documentation should be available. Positive availability should be provided for all equipments during installation and by contractor service if necessary until enough internal organizational training is accomplished to reduce the need for outside support. Equipment down-time during initial programming development, demonstration, and testing is very costly. It sometimes kills a system development effort.





SAMPLE SYSTEM # 1

Some user personnel should be participating in the installation of hardware in order to reduce the need for outside services. Scheduling is important here as well as selection of that individual or individuals who will work at the CRT display for sample system #1.

The user personnel should be involved in this effort for this system to assure that the data base design is valid. This is a quick method for training the operator who must actually maintain this data base.

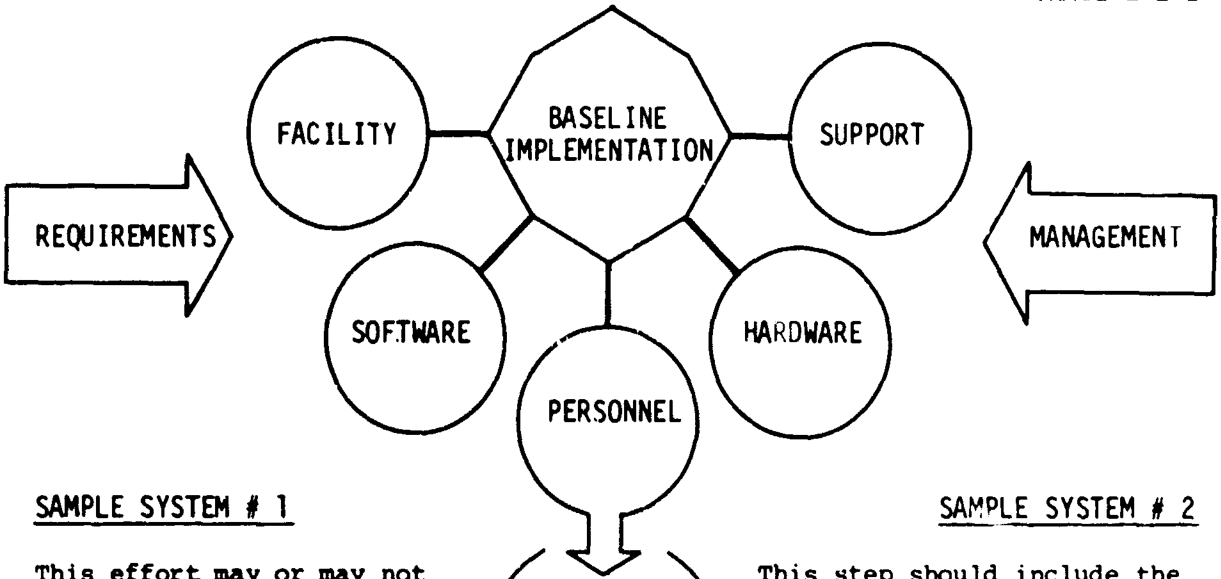
This step is not necessary for sample system #1.

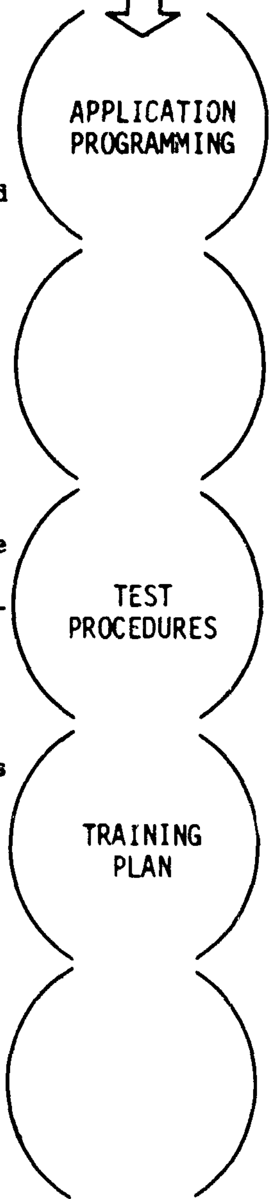
SAMPLE SYSTEM # 2

Some user personnel should be participating in the installation of hardware in order to reduce the need for outside services. Scheduling is important here as well as selection of that individual or individuals who will work at the various man-machine stations.

The user personnel should be involved in this effort to assure that the data base design is valid. This is a quick method for training the operators who must actually maintain this data base.

This normally does not involve many user personnel; however, documentation for future maintenance of this program must be very complete and generated during the Baseline Implementation Task. It is seldom redone and a key to good reference material in that it is done by the programmers actually doing the detailed modifications, with experienced editorial cleanup prior to publication.





SAMPLE SYSTEM # 1

This effort may or may not involve the user personnel. For this sample system, it would not if the system is to be turned over as a complete package. However, good documentation and periodic coordination throughout this step is needed between the programmers and the users for sample system #1.

This step must reflect the man-machine operations at the display console and can be the basis for operator training in sample system #1.

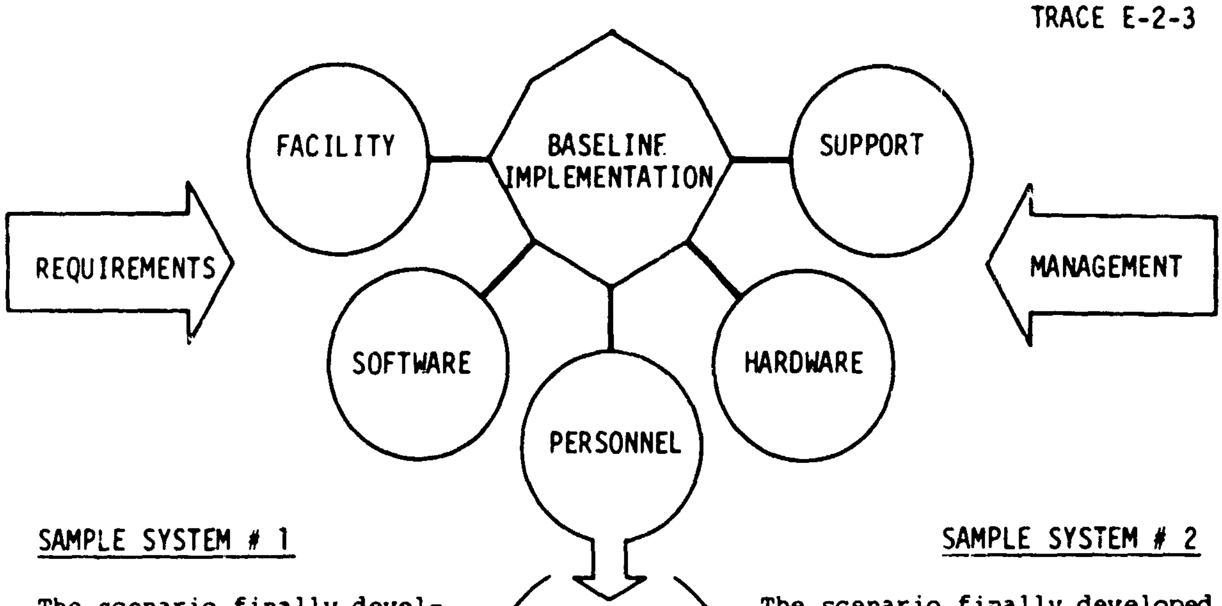
This step should be closely coordinated with the previous step for sample system #1. It does not have to be an extensive effort in this case.

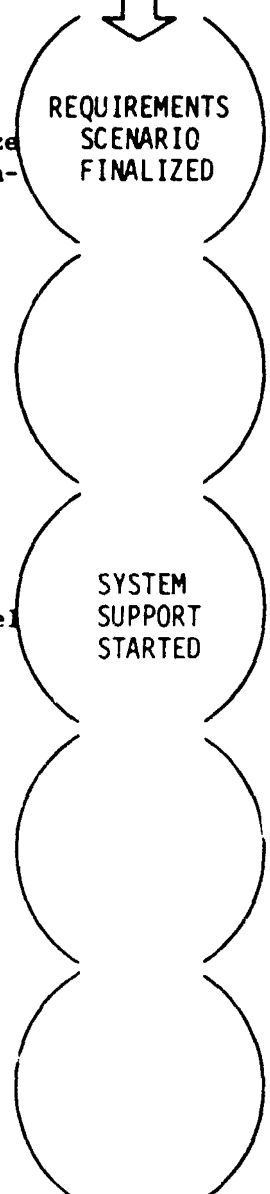
SAMPLE SYSTEM # 2

This step should include the user personnel and is a very important factor to future training, software maintenance, and other support element aspects. The method by which this step is performed determines whether operational programming support will be provided by in-house military, civil service personnel, or contractor personnel for a long time after the Baseline Implementation Task.

This step must reflect the man-machine operations at all the operator positions and can be the basis for operator training in sample system #2.

This step should be closely coordinated with the previous step and formal training started at the training organization in order for personnel to come in as productive system staff members in the future.





SAMPLE SYSTEM # 1

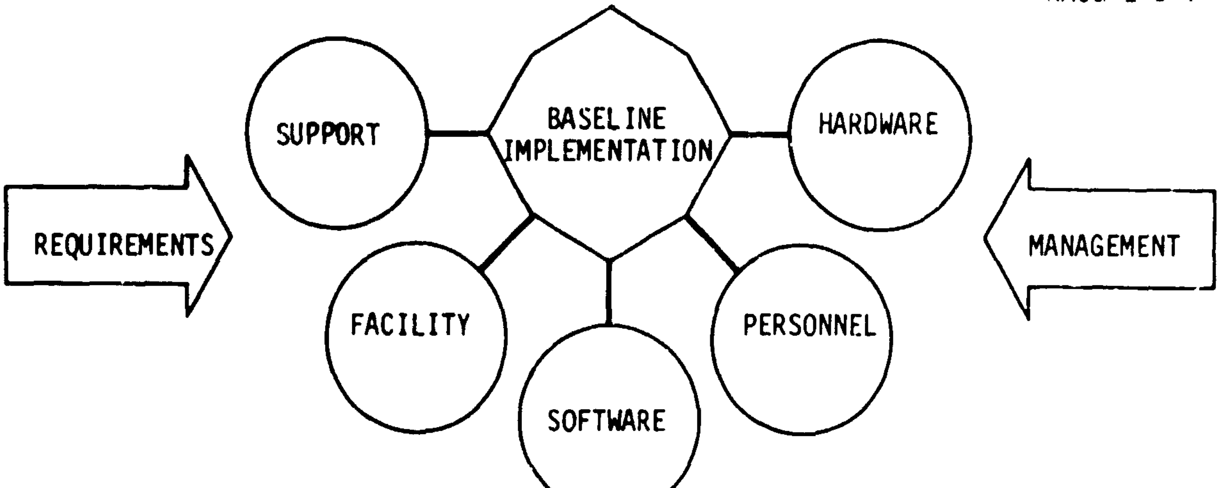
The scenario finally developed at this point should also be coordinated with the two previous steps to maximize its use to help operator transition to full productivity with the system.

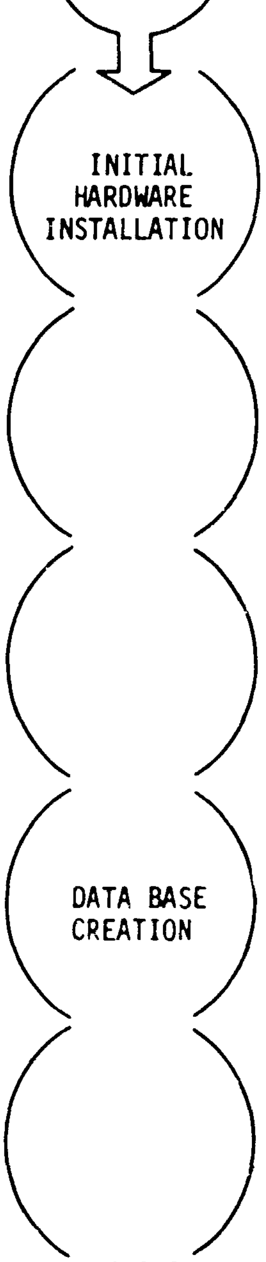
Initial supplies for use by the operator and reference documentation in the working area will affect the personnel element most at this point for this Baseline Implementation Task.

SAMPLE SYSTEM # 2

The scenario finally developed at this point should also be coordinated with the two previous steps to maximize its use to help operator transition to full productivity with the system.

Initial supplies for use by the operator and working area documentation will affect the personnel element most at this point for this Baseline Implementation Task.





SAMPLE SYSTEM # 1

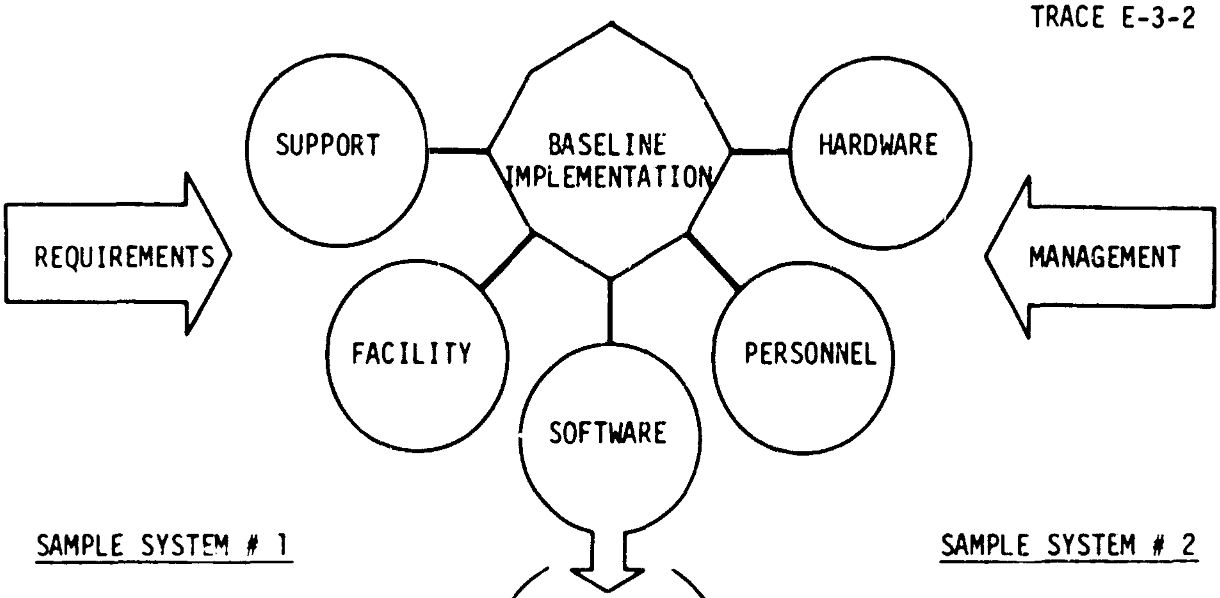
This step will be necessary in order to complete check-out of the application programs for sample system #1.

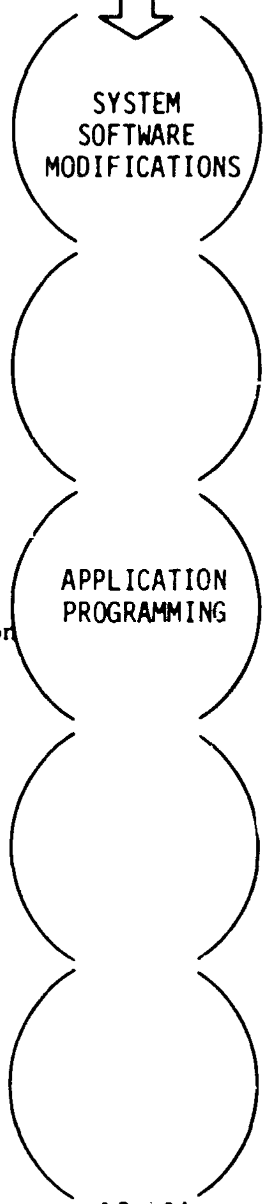
This step will affect the exercising of sample data during checkout of the application programs. This should be done as soon as possible after the System Specification Design Task is finished.

SAMPLE SYSTEM # 2

The data processing and one each of the on-line terminal or peripheral equipments should be installed in order to perform all programming steps. If this is not possible at an early enough point after System Specification to allow for system operation in time to meet set management schedules, then outside duplicate hardware elements will have to be used. Other functional hardware which are not connected to the EDP components are not needed for succe ul completion of this step

This step will affect the exercising of sample data during checkout of the application programs. This should be done as soon as possible after the System Specification Design Task is finished.





SAMPLE SYSTEM # 1

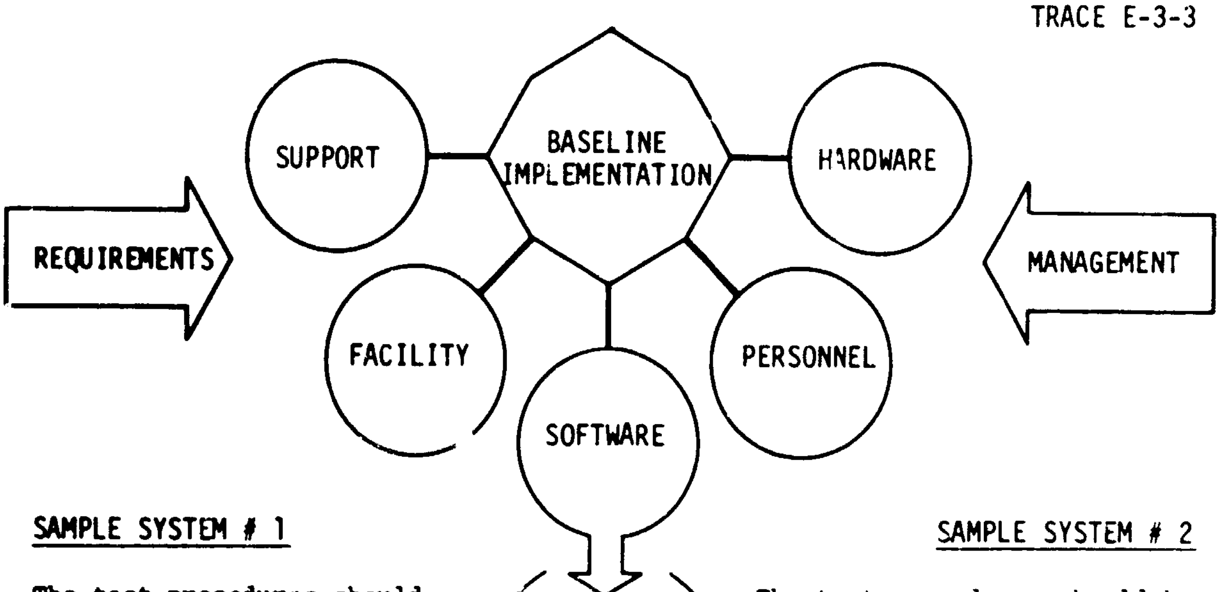
This step is not applicable for sample system #1.

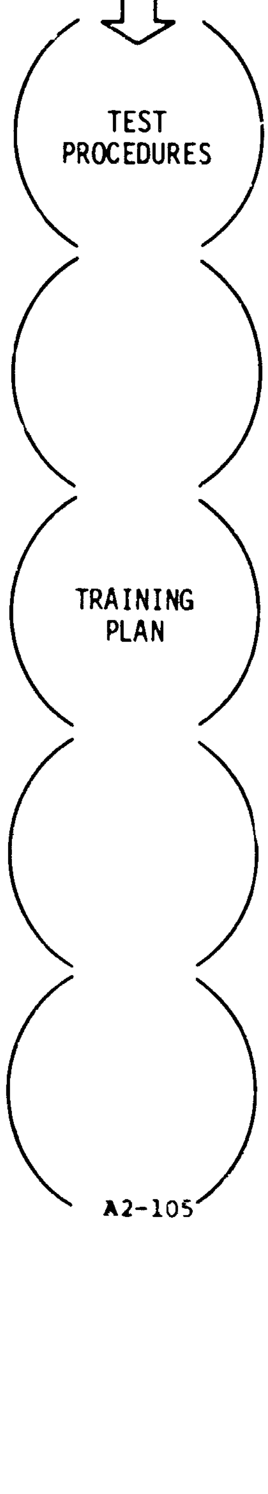
This is the main software implementation step for sample system #1. Careful documentation and coordination between the data base creation and final scenario are necessary here.

SAMPLE SYSTEM # 2

If an existing EDP system is to be used and its system software must be modified, this should begin as soon as possible. Coordination with the manufacturer is helpful here and often the manufacturer's system programmers can best do this step in the shortest period of time. File management system software should be completed as soon as possible also.

This is a major part of the software effort in this system. Every man-machine station where peripherals are connected to data processors for other than data reduction purposes require application programs. Close coordination with the user and other steps in this task are necessary, i.e., data base creation, test procedures, training, and scenario activities.





SAMPLE SYSTEM # 1

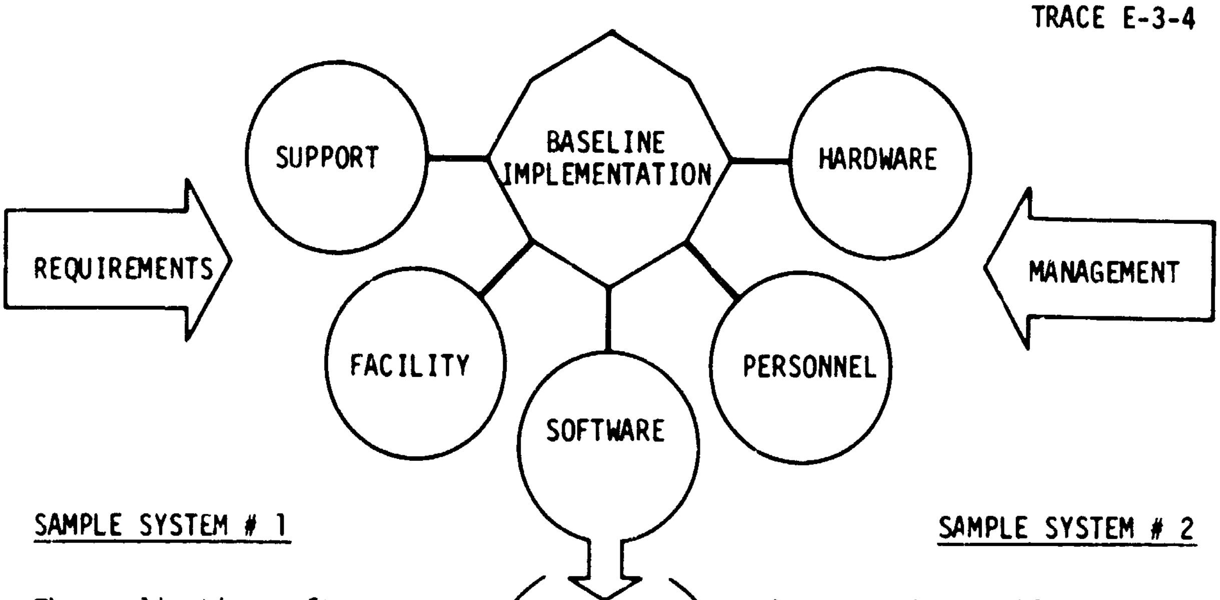
The test procedures should reflect the application software completely.

The training will not include any software elements for sample system #1.

SAMPLE SYSTEM # 2

The test procedures should be oriented to check system software and then to check application programs with the data base and its file management system. The scenario should be the guide for the test conditions for these software elements. Very clear procedures, standard forms, and preparatory training will be needed for this system test effort.

Significant effort will be expended in software training. The plan for guiding this activity should be a fallout of each area of software development. Formal training sessions combined with on-the-job work experience will be the best combination in all software areas.



SAMPLE SYSTEM # 1

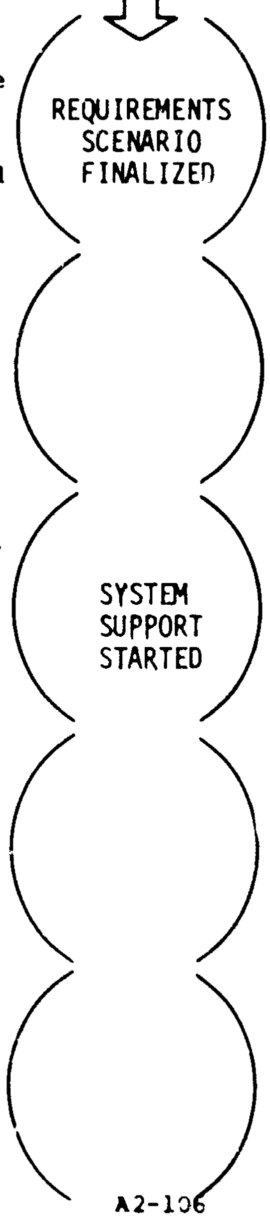
The application software should take maximum advantage of a good scenario. In this way the training and test planning steps are simplified for a system like this.

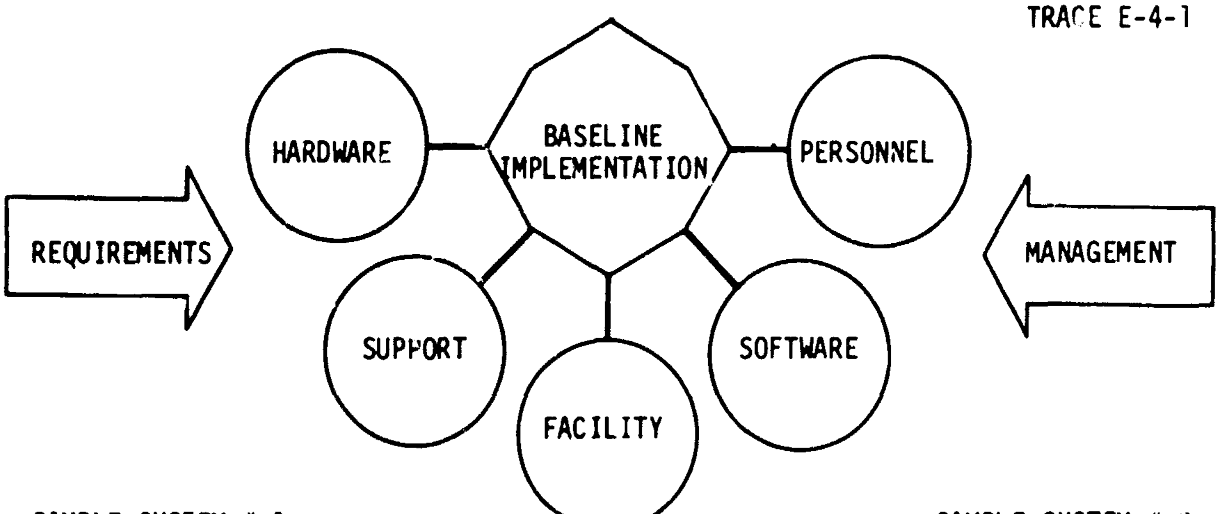
Initial, programming support supplies should be available, and future application programming support should be identified at this time so its acquisition can be planned.

SAMPLE SYSTEM # 2

The scenario should be closely coordinated with the application software and file management software These items will be two key software elements that should be coordinated, checked, demonstrated, and approved as objectively as possible in such a large system as this.

Initial, programming support supplies should be available, and future application programming support should be identified at this time so its acquisition can be planned.

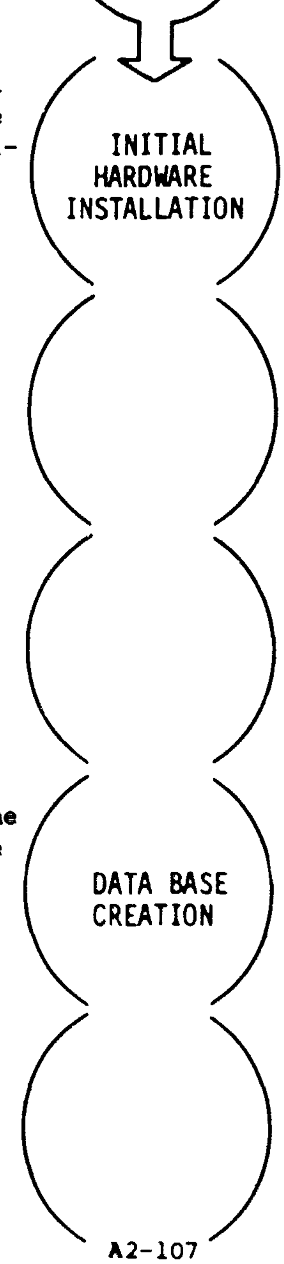




<u>SAMPLE SYSTEM # 1</u>

Minor facility elements will be affected by this hardware installation since the facility changes should be minor for sample system #1. Some cabling, air-conditioning, or false flooring items may be adjusted at installation time, but they should have been planned well enough earlier so this will not happen at this point.

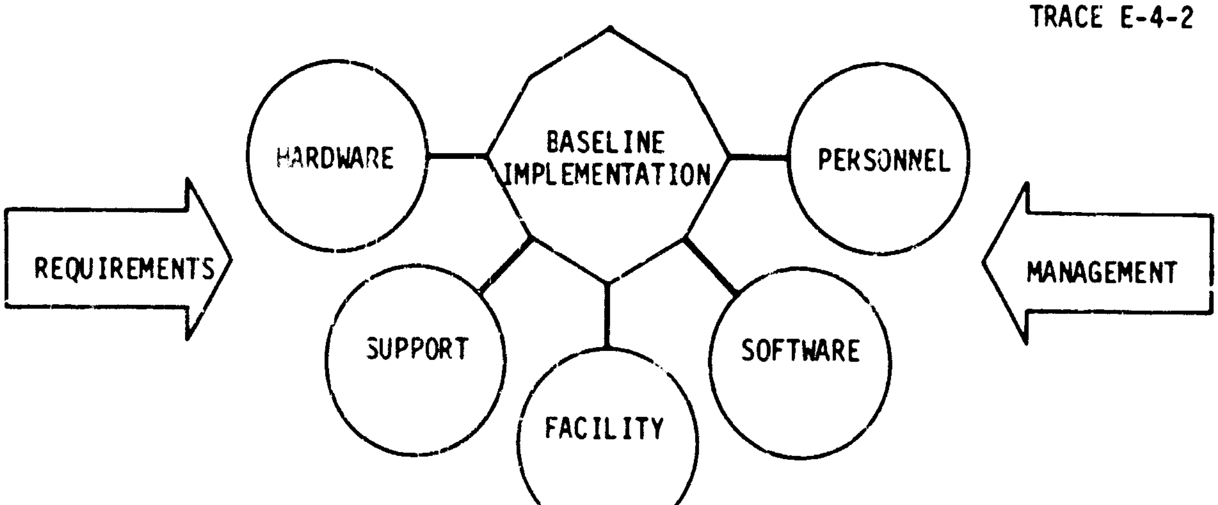
This step will not affect the facility elements for sample system #1.

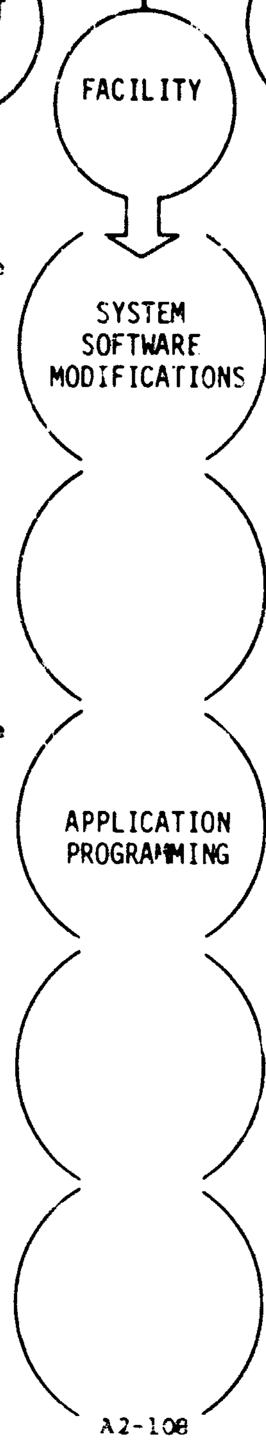


<u>SAMPLE SYSTEM # 2</u>

In a complex system such as this where hardware will be installed over a relatively long period of time, the facility should be prepared in an evolutionary manner also. Flexible partitioning schemes should be used for man-machine work areas so adjustments can be made. Critical, environmentally controlled areas and secure areas should be ready before hardware installation. All major, heavy construction should be completed also. Plumbing, duct routes, large bay areas with false flooring, elevators, stairs, and air-conditioning should be ready, but internal partitions should wait in some sections of the facility.

This will affect the facility elements only as far as the availability of operating space for the personnel to work at desks. The electronic data processing area should be ready early, because the EDP components must be used as soon as possible for accomplishing this step.





SAMPLE SYSTEM # 1

This step will not affect the facility elements for sample system #1.

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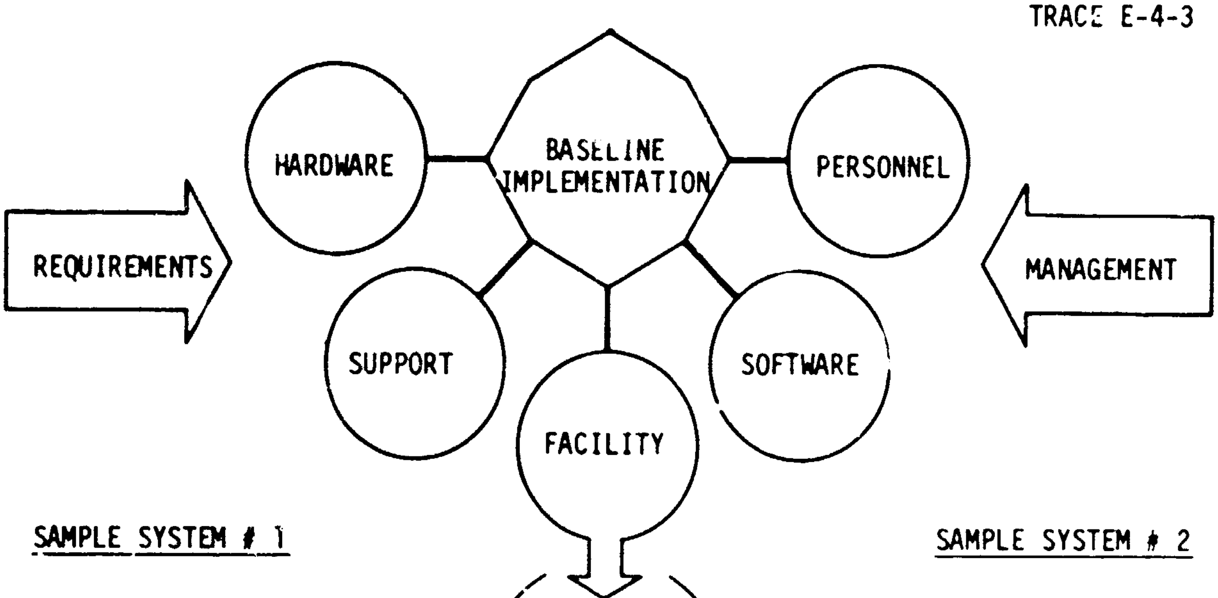
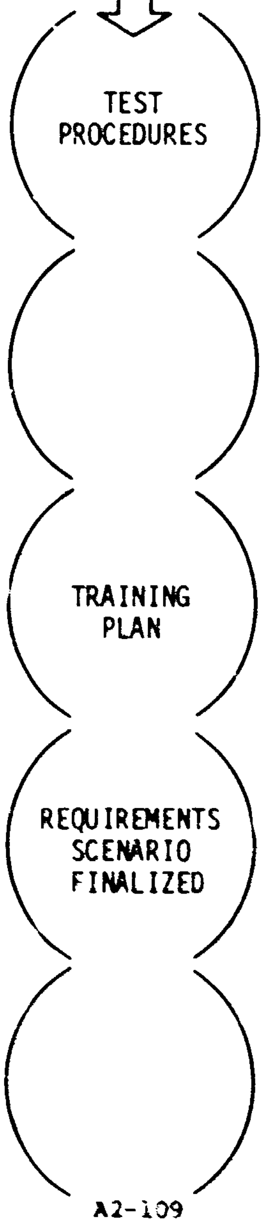
SAMPLE SYSTEM # 2

This will affect the facility elements only as far as the availability of operating space for the personnel to work at desks. The electronic data processing area should be ready early, because the EDP components must be used as soon as possible for accomplishing this step.

This will affect the facility elements only as far as the availability of operating space for the personnel to work at desks. The electronic data processing area should be ready early, because the EDP components must be used as soon as possible for accomplishing this step. A representative set of on-line terminals must also be available and connected to the EDP components for this activity.





SAMPLE SYSTEM # 1

This step will not affect the facility elements for sample system #1.

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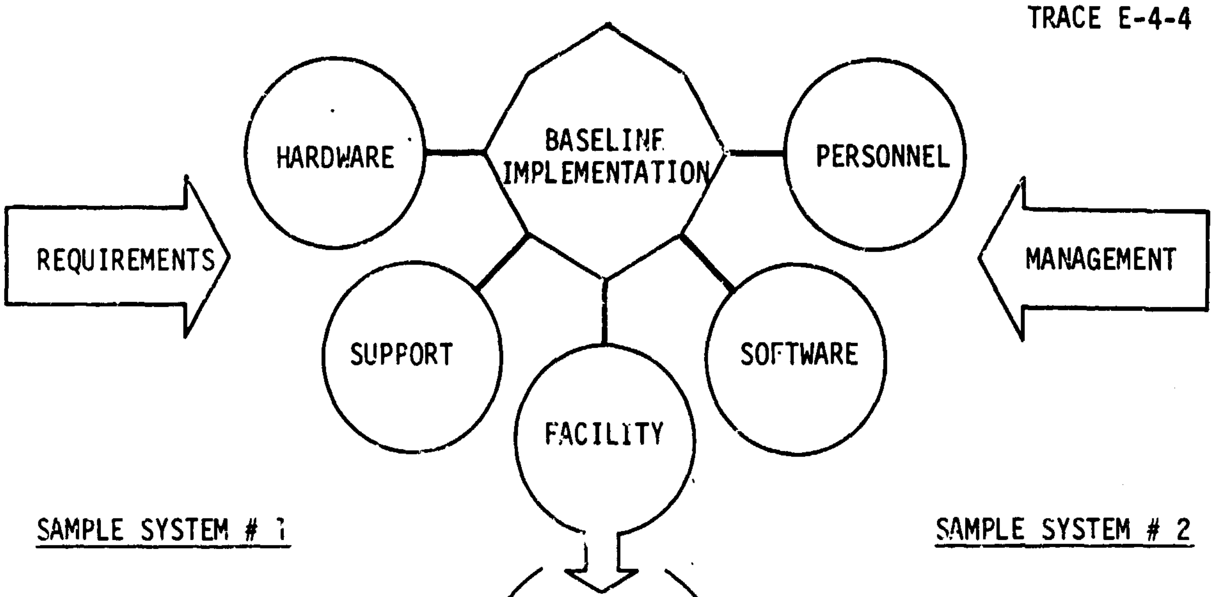
SAMPLE SYSTEM # 2

This will affect the facility elements only as far as the availability of operating space for the personnel to work at desks. The electronic data processing area should be ready early, because the EDP components must be used as soon as possible for accomplishing this step. A representative set of on-line terminals must also be available and connected to the EDP components for this activity.

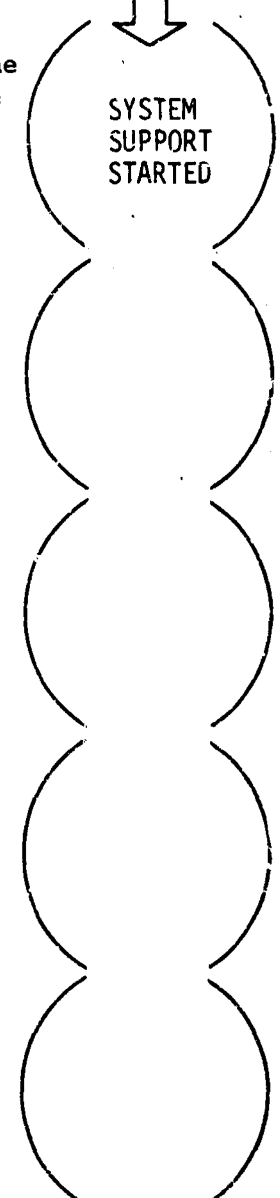
This step has very little effect on the facility elements in any system. If new uncleared personnel will be trained prior to receipt of security clearances, then special areas may have to be set aside for this activity.

This step has very little effect on the facility elements unless the facility is a shelterized complex instead of a fixed installation.



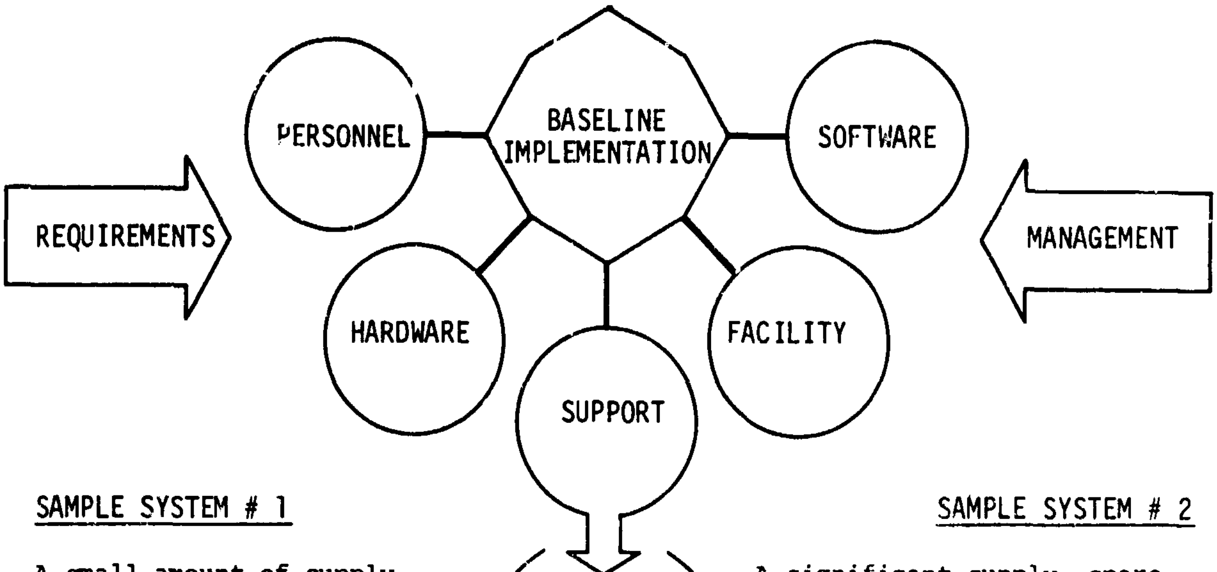
SAMPLE SYSTEM # 1

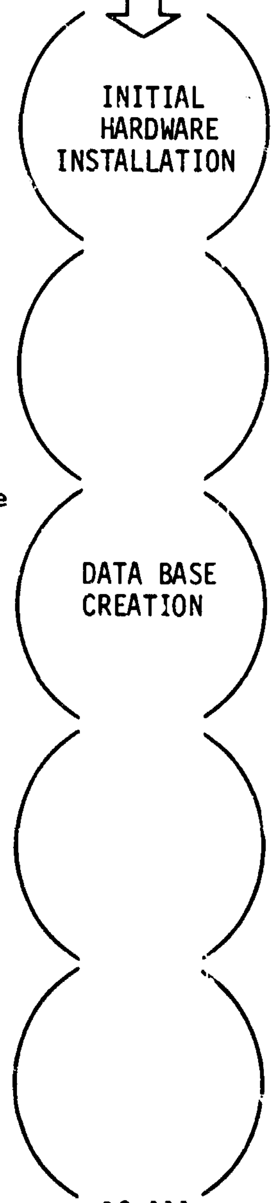
This step will not affect the facility elements for sample system #1.



SAMPLE SYSTEM # 2

This step should begin as soon as possible and space needs for maintenance personnel, parts, supplies, special test equipment, etc., will be used as soon as any hardware is installed. This step should be monitored closely to determine if adjustments should be made to the facility plans prior to complete system installation and future system use.





SAMPLE SYSTEM # 1

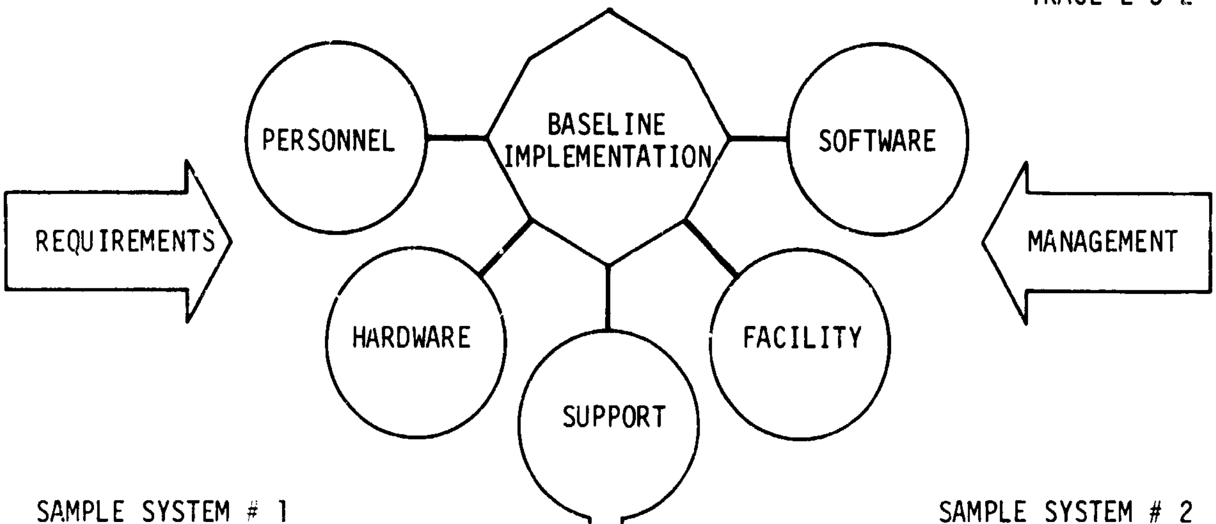
A small amount of supply, spare parts, and maintenance support will be needed as soon as the CRT display is installed. The initial support activity should be monitored to assure that support element planning has been complete and accurate.

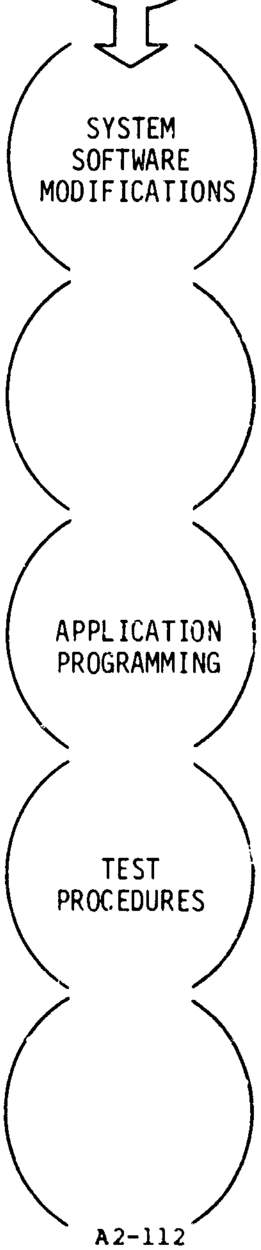
This step will not affect the support elements for sample system #1.

SAMPLE SYSTEM # 2

A significant supply, spare parts, and maintenance activity must start at this point. This activity should be monitored and evaluated closely in order to validate or adjust future hardware support needs.

Supplies for the personnel and housekeeping services while this activity is going on will be needed. Special equipments may be needed for this step also. Some of these may or may not remain with the operational system after this activity is finished.





SAMPLE SYSTEM # 1

This step will not affect the support elements for sample system #1.

This step will affect the supply needs for the programmers developing the application programs for a short period. Some housekeeping requirements may also develop as a result of this step but they will be minor.

This step will affect the supply needs to a minor degree depending on the length of time allocated for the test.

SAMPLE SYSTEM # 2

Supplies for the personnel and housekeeping services while this activity is going on will be needed. Special equipments may or may not be needed for this step. They may not remain with the operational system after this activity is finished.

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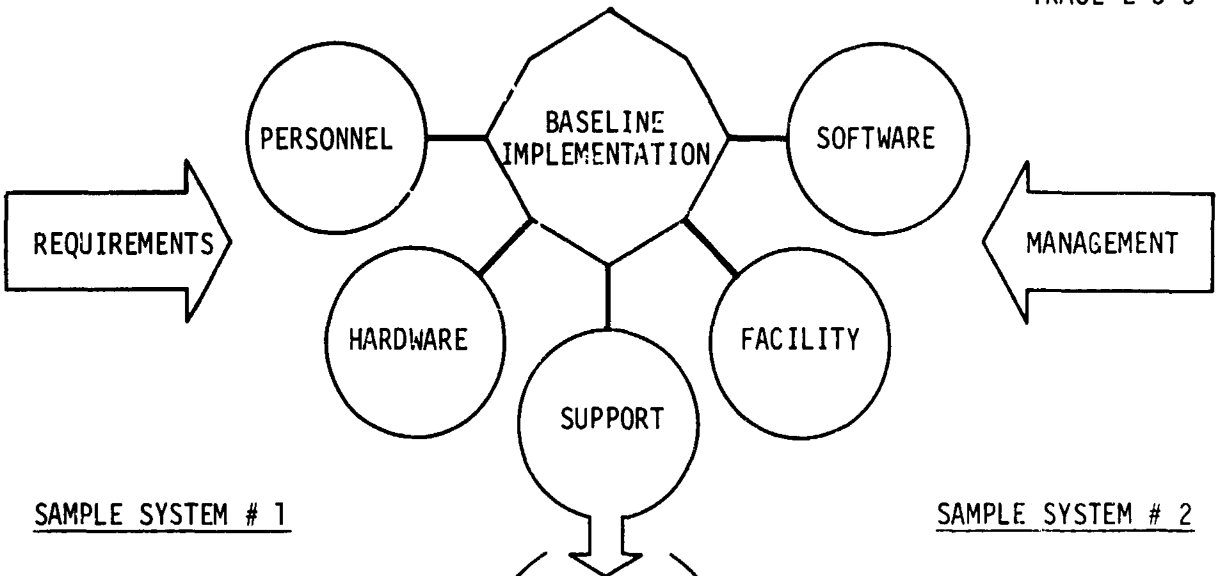
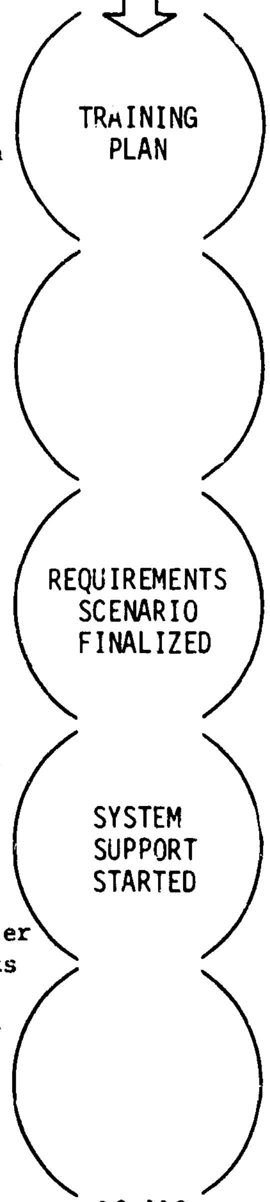
Supplies for the personnel and housekeeping services while this activity is going on will be needed. Special equipments may be needed for this step also. They may or may not remain with the operational system after this activity is finished.





SAMPLE SYSTEM # 1

Minor supply needs will be affected by this step. Some contractor support may be required at this time even on a small system like this.

Minor supply needs will be affected by this step. Some contractor support may be required even on a small system like this.

This step is the summation of activity related to initial supply accumulation, spare part storage, maintenance agreements, and housekeeping that must be performed in order to use the new system elements when and as planned in Baseline Exercising and later under full operational use.

SAMPLE SYSTEM # 2

Supplies for the personnel and housekeeping services while this activity is going on will be needed. Special equipments may be needed for this step also. They may or may not remain with the operational system after this activity is finished.

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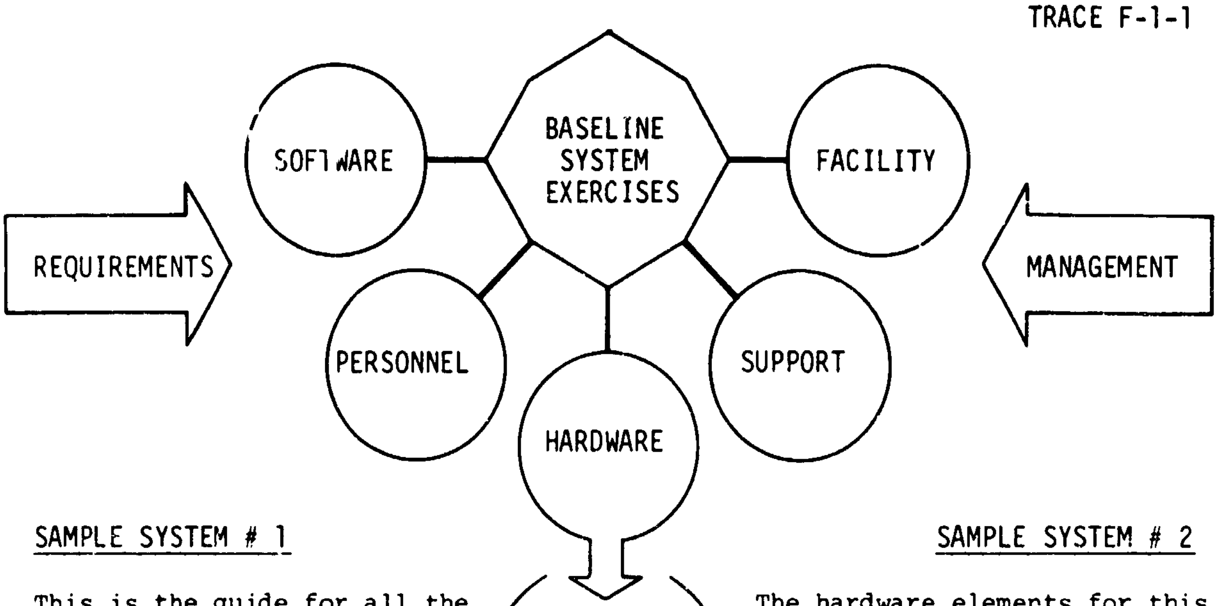
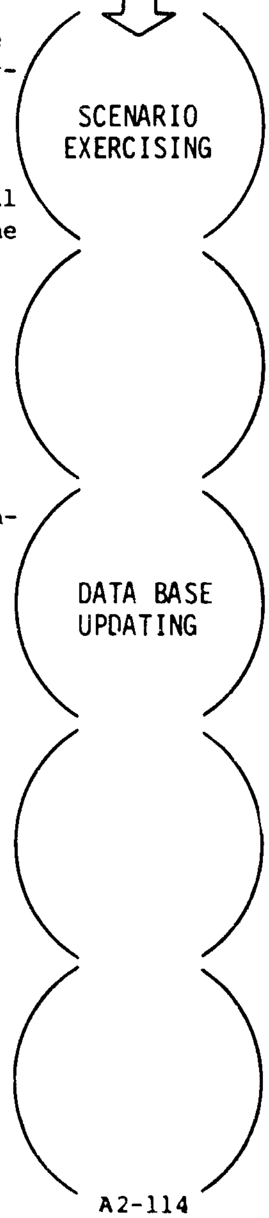




SAMPLE SYSTEM # 1

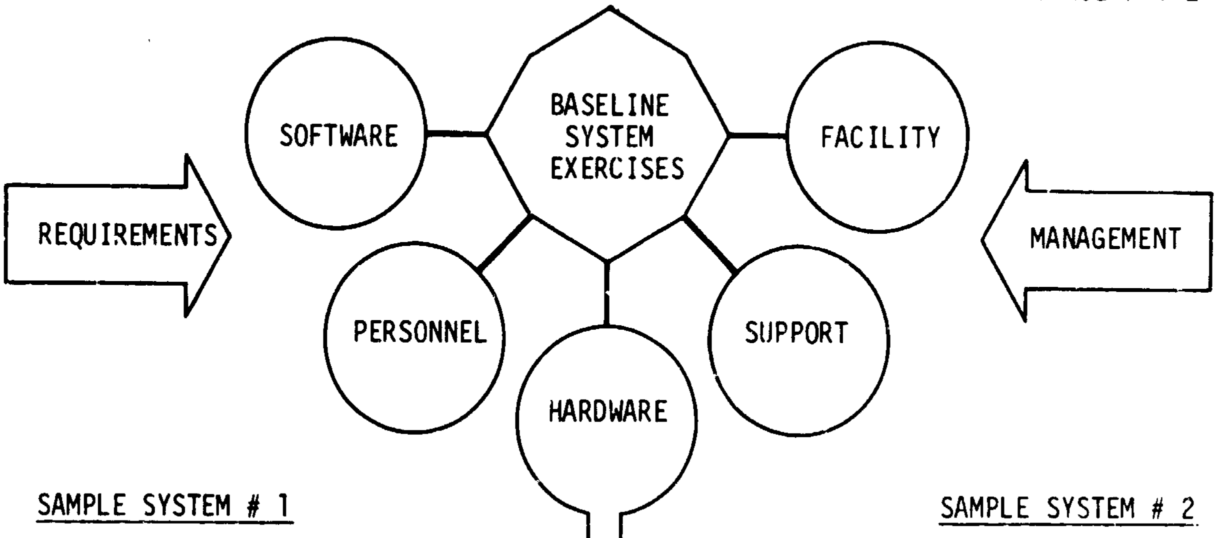
This is the guide for all the test activity and is the overall procedure which can be coordinated with management and other interested groups to demonstrate the operational utility of the features of the CRT display as used in this system.

This step will test and demonstrate the display's keyboard for functional utility and will help confirm the displayed image is satisfactory during the intended operation.

SAMPLE SYSTEM # 2

The hardware elements for this system will have to be exercised first, in functional groups by using the proper portion of an overall scenario. The scenario should be able to be fragmented into logical working sections to later be put together. Each hardware item must be exercised through its operational ranges under various input/output conditions as applicable.

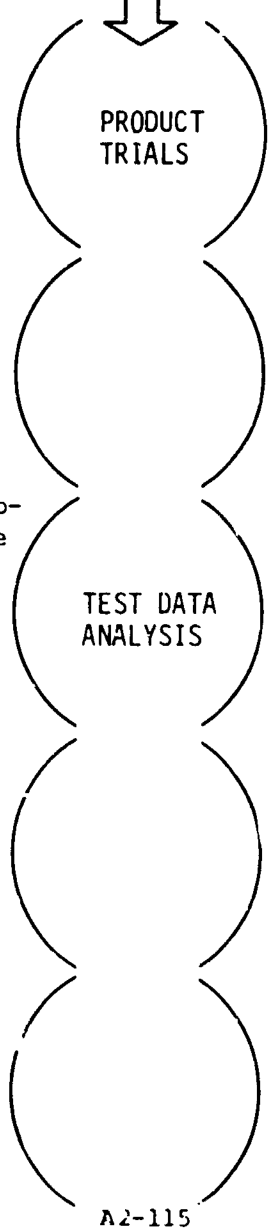
This effort is one of the key exercises to perform because a significant portion of the hardware installed is usually in the system to support this function. All such hardware should be exercised over a period of time using the proper given data in the scenario.



SAMPLE SYSTEM # 1

This step is the same as the previous one for sample system #1.

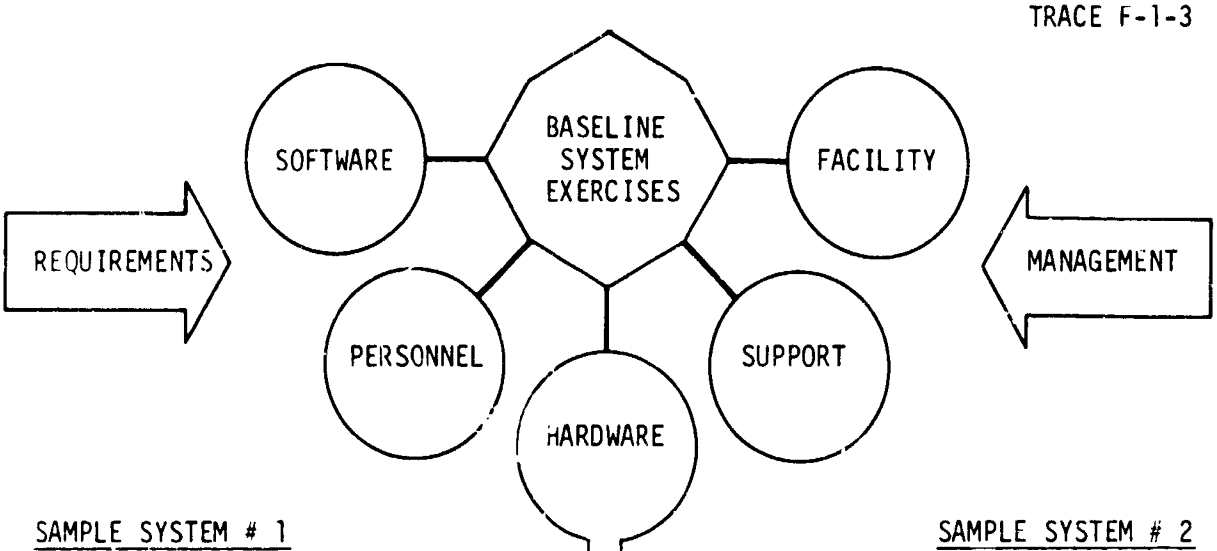
The time and activity data observed and recorded should be analyzed for hardware relationships. Undesirable data rates or operator experiences should be reviewed to determine if the display console design should be changed to improve these undesirable factors.

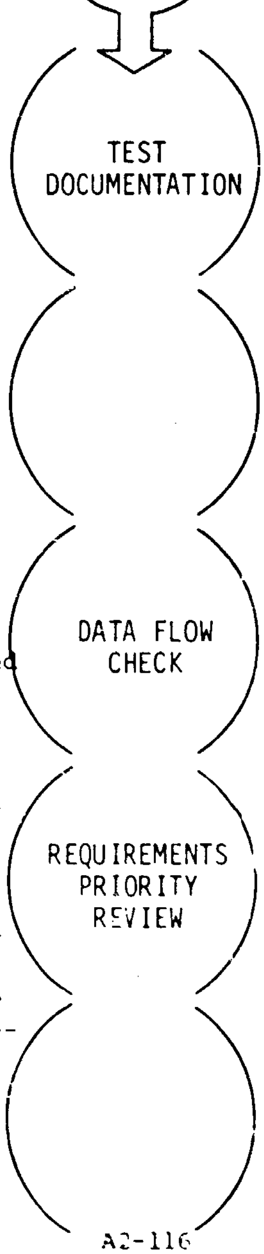


SAMPLE SYSTEM # 2

This effort is one of the key exercises to perform because a significant portion of the hardware is in the system to support this function. All such hardware should be exercised over a period of time using the proper given data in the scenario.

The time and activity data observed and recorded should be analyzed for hardware relationships. Undesirable data rates or operator experiences should be reviewed to determine if the display console design should be changed to improve these undesirable factors. The results of this analysis must be coordinated with management and is the user's information by which he can objectively support full system implementation or needed modifications to previously established specifications.





SAMPLE SYSTEM # 1

All test information during Baseline System Exercises should be documented for later evaluation. Planning should have been done in the Test Plan step of Baseline Implementation which established the documentation procedures to be followed here.

The hardware performance and physical features should be considered as the data flow is used, and checked by analyzing the test data collected when using the scenario for this task on this system.

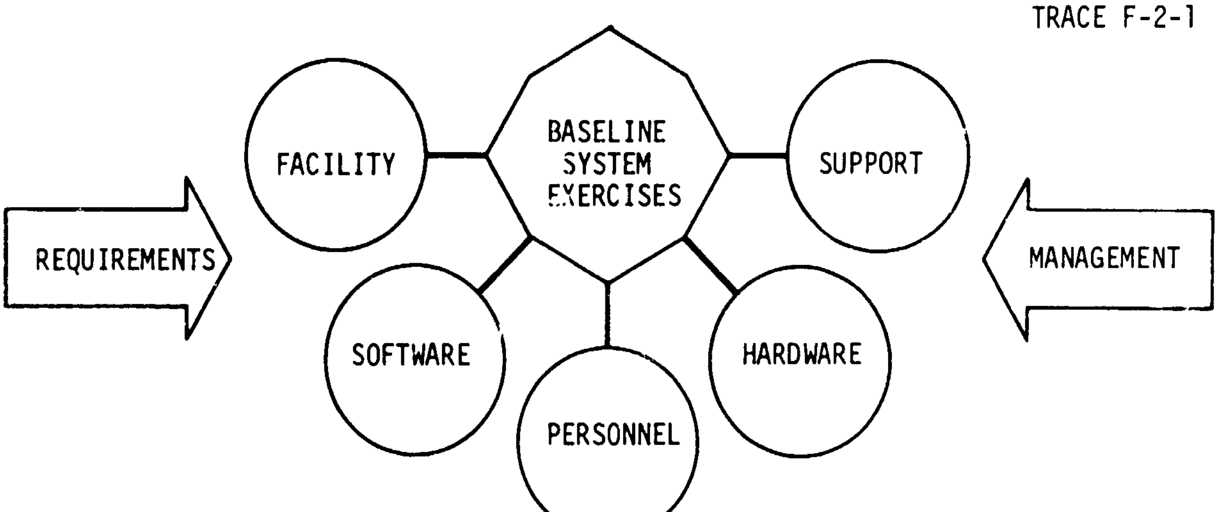
This final, and critical, review from the Baseline System Exercises is an evaluation of the acceptability of the product that is generated by this system. Again, the hardware elements must be checked against this product--which is an edited and approved set of records in a digital file for sample system #1.

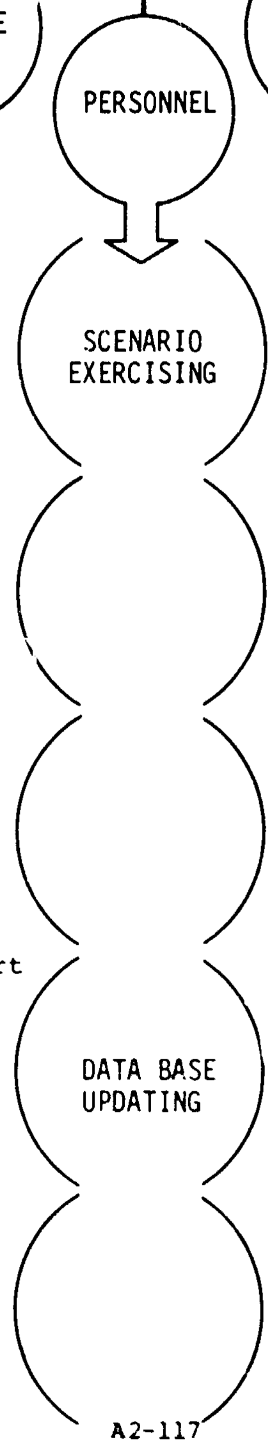
SAMPLE SYSTEM # 2

All test information during Baseline System Exercises should be documented for later evaluation. Planning should have been done in the Test Plan step of Baseline Implementation which established the documentation procedures to be followed here.

The hardware performance and physical features should be considered as the data flow is used, and checked by analyzing the test data collected when using the scenario for this task on this system.

The many products must be reviewed for priority at this time, because, perhaps new ones are being generated for the first time in this Baseline System Exercise. The hardware elements must be carefully checked as to their part in contributing to or degrading the products. This data can guide the modification to be performed during final implementation.





SAMPLE SYSTEM # 1

The use of this relatively small scenario will help validate the personnel estimates about experience required, numbers needed, and the operator working condition from a human factors standpoint. This step can also be a main operator training vehicle for sample system #1.

This exercise should be a part of the scenario for sample system #1. It will affect the personnel elements in much the same way that the previous step validated earlier personnel analyses.

SAMPLE SYSTEM # 2

This step will be extremely important in this system. By forcing all system operations to be exercised by "user-operators," the unit manning estimates can be changed if necessary in sufficient time to have an operational staff available by the time of Operational Acceptance. This will also check skill levels needed at each man-machine interface point, and at which points there is need for multiple operators or a frequent change of operators.

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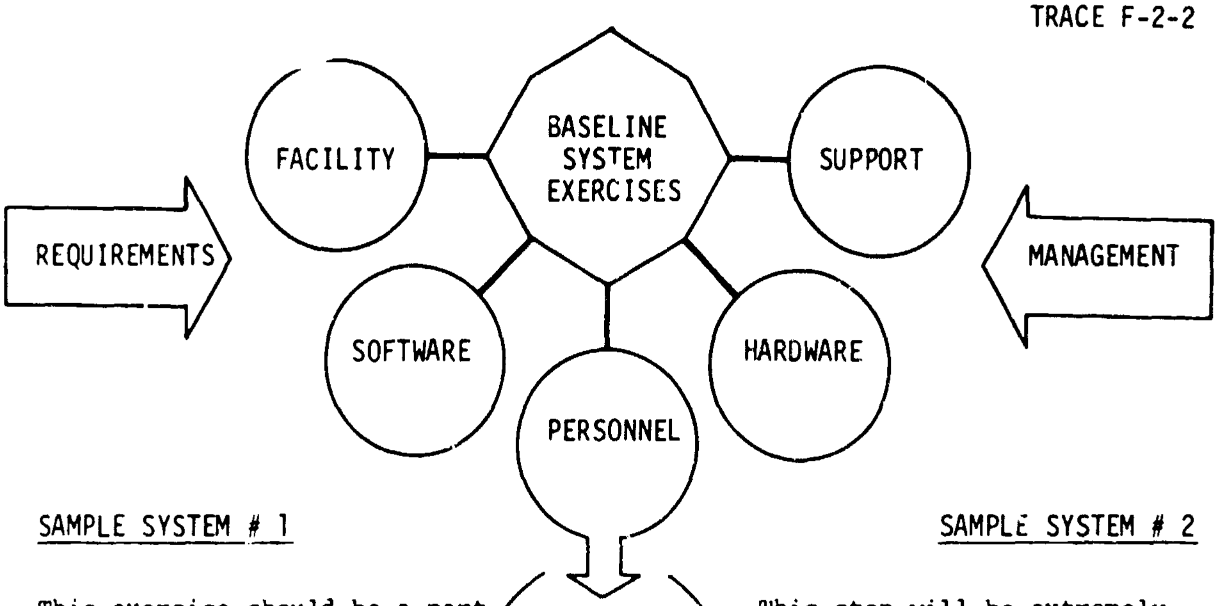
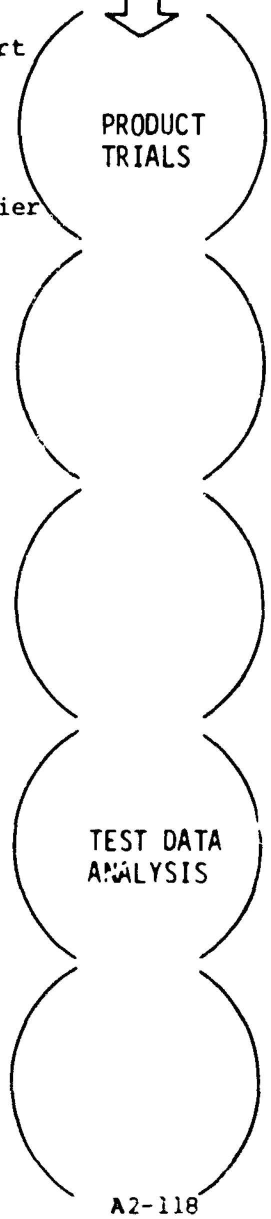
TRACE F-2-2





SAMPLE SYSTEM # 1

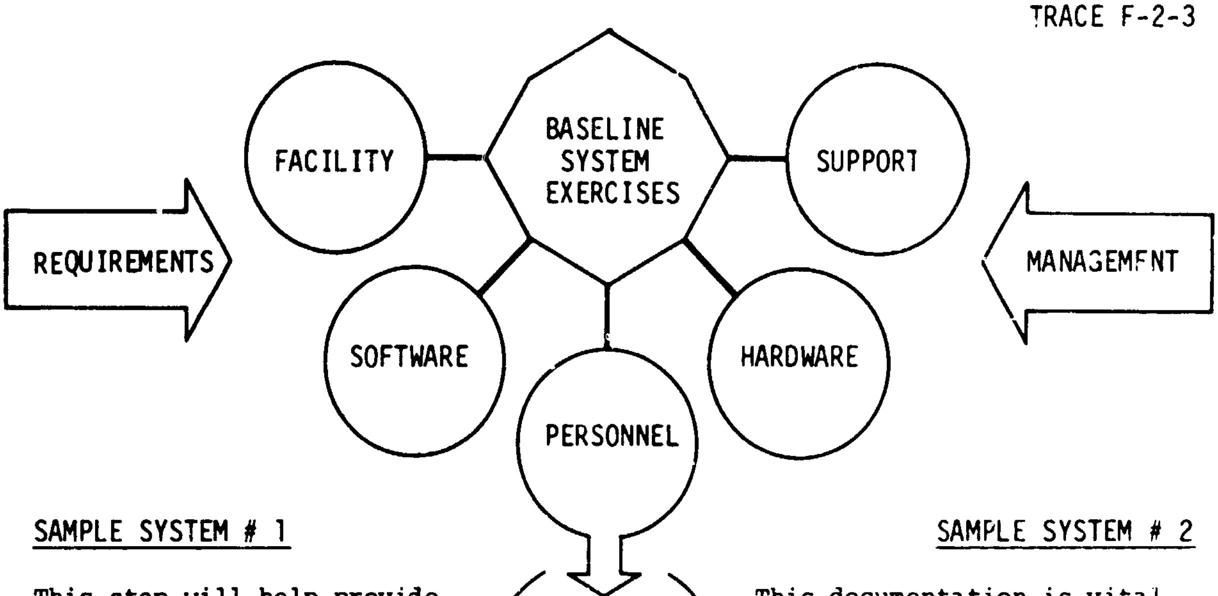
This exercise should be a part of the scenario for sample system #1. It will affect the personnel elements similarily to the way the previous step validated earlier personnel analyses.

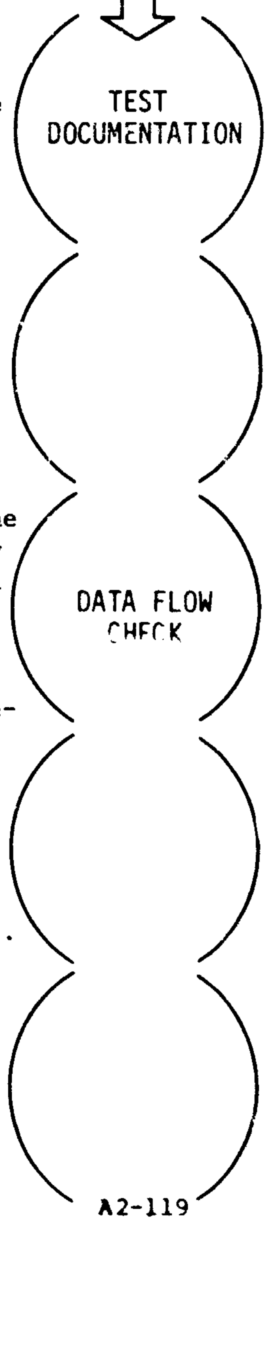
The test data from these exercises should be analyzed from a human factors standpoint for the operator position at the console and for future scheduling of one or more people to be production operators.

SAMPLE SYSTEM # 2

This step will be extremely important in this system. By forcing all system operations to be exercised by "user-operators," the unit manning estimates can be changed if necessary in sufficient time to have an operational staff available by the time of Operational Acceptance. This will also check skill levels needed at each man-machine interface point, and at which points there is need for multiple operators or a frequent change of operators.

This step will be the activity needed in order to decide changes to the personnel plans and estimates developed during System Concept Design. This needs to be coordinated thoroughly with the user at the earliest convenience on a large system such as this.





SAMPLE SYSTEM # 1

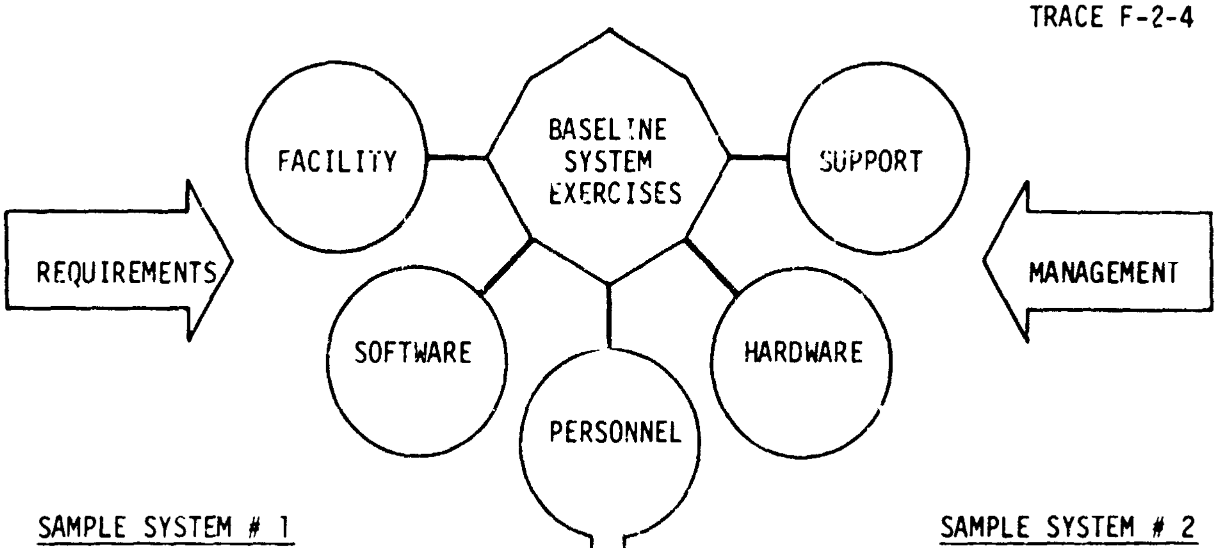
This step will help provide future training data and if this Baseline System Exercise is close to the final task of Operational Acceptance, then it can be used as part of the acceptance material for sample system #1.

The data flow performed at the CRT display should be closely reviewed and compared to that specified early in order to assure that all personnel experience requirements have been exercised. This is necessary to avoid overlooking a key operation that may be needed in an untested situation which would illustrate a heretofore overlooked personnel deficiency as the system is initially installed.

SAMPLE SYSTEM # 2

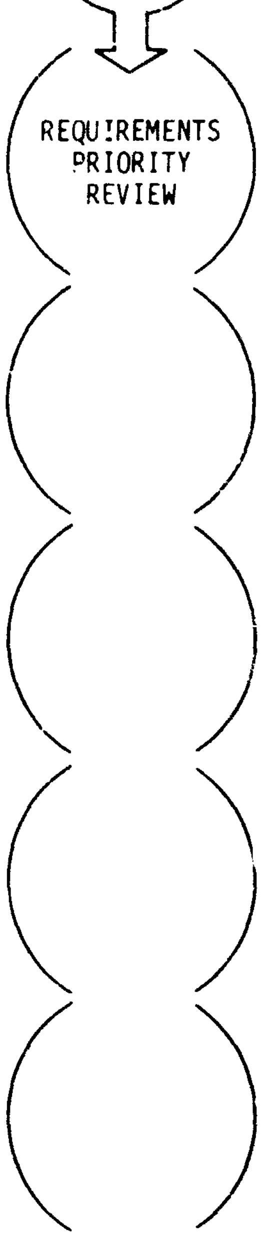
This documentation is vital for reference and direct use in preparation of future training materials for operator personnel. This may be better classified as a support element; however, it is closely associated with the personnel plans also. The test documentation is needed by the system analyst to justify changes or current approaches when they are validated.

This step will be important to personnel, because any changes will undoubtedly affect the number of manual positions and the skill requirements. The length of time each operator stays at the various operator-positions or can handle more than one work task should be evaluated for optimum data flow by a minimum number of personnel.



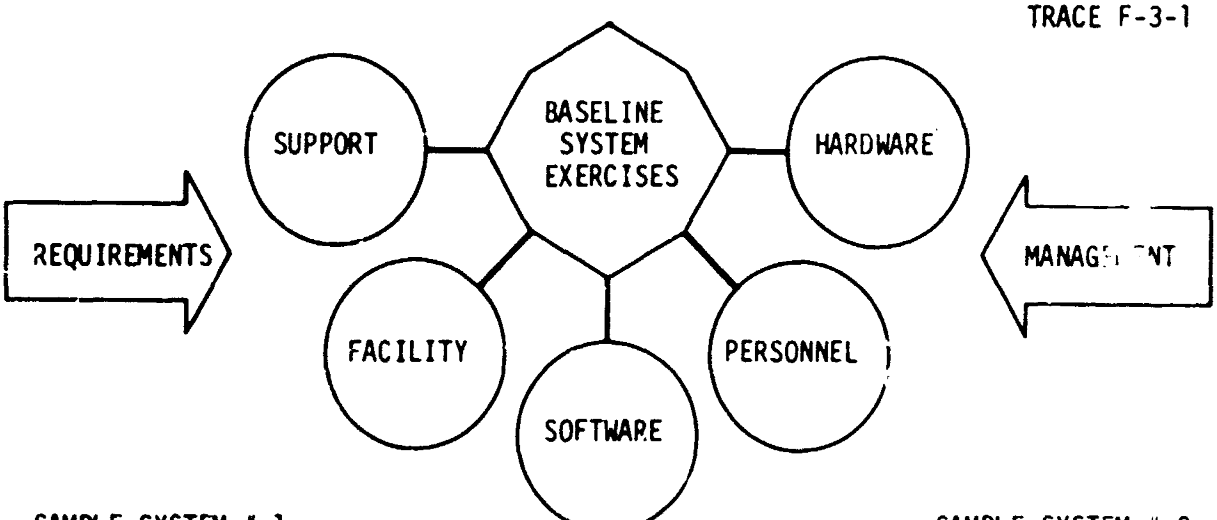
SAMPLE SYSTEM # 1

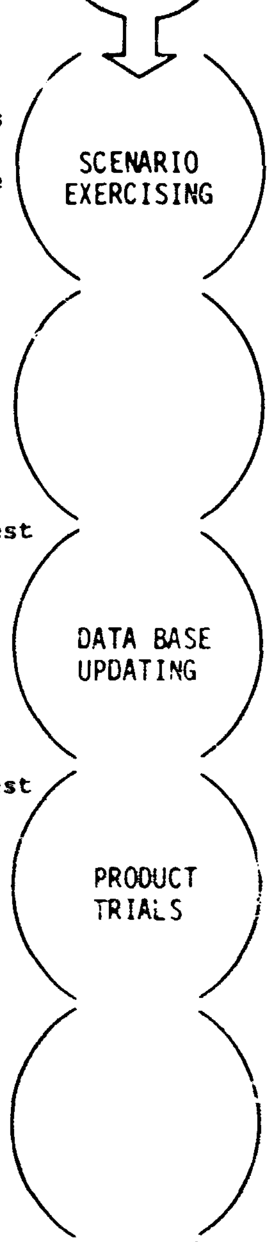
This step is not applicable for sample system #1.



SAMPLE SYSTEM # 2

All of the requirements for system operation should be reviewed against what occurred during actual Baseline System Exercises to assure that proper priorities are established for various manpower skills. This should be passed on to system user-commands as soon as possible to aid their "plans and programs" activity.





SAMPLE SYSTEM # 1

This step should primarily test the application programs and validity of the data files' organization in sample system #1.

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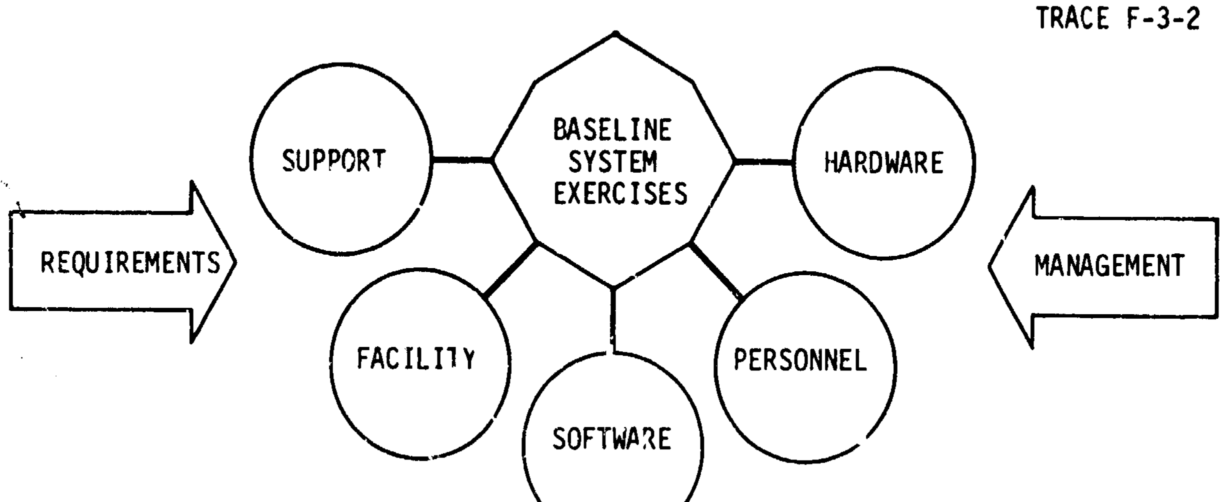
This step should primarily test the application programs and validity of the data files' organization in sample system #1.

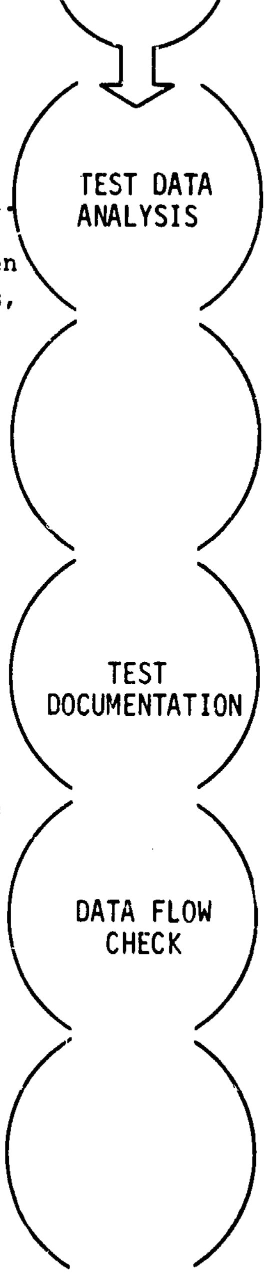
SAMPLE SYSTEM # 2

This step will exercise all portions of the software but should especially be concerned with the application programs and the file management system programs. All data conversion routines and utility programs must also be exercised under control of the executive from all on-line stations or batch operating stations identified in the System Concept Design.

This will be a sub-set of the scenario and will check those same software elements as mentioned in the previous step, but primarily for the data base update functions.

This will be a sub-set of the scenario and will check those same software elements as mentioned in that step, but primarily for the research, analysis, and product generation functions.





SAMPLE SYSTEM # 1

This step should result in any recommendations for changing the application programs for sample system #1. In a system like this, there is room for a tradeoff between implementing software changes, hardware changes, or for procedural changes on the part of the operator.

This step is required for helping develop software reference documentation as well as test data analysis information.

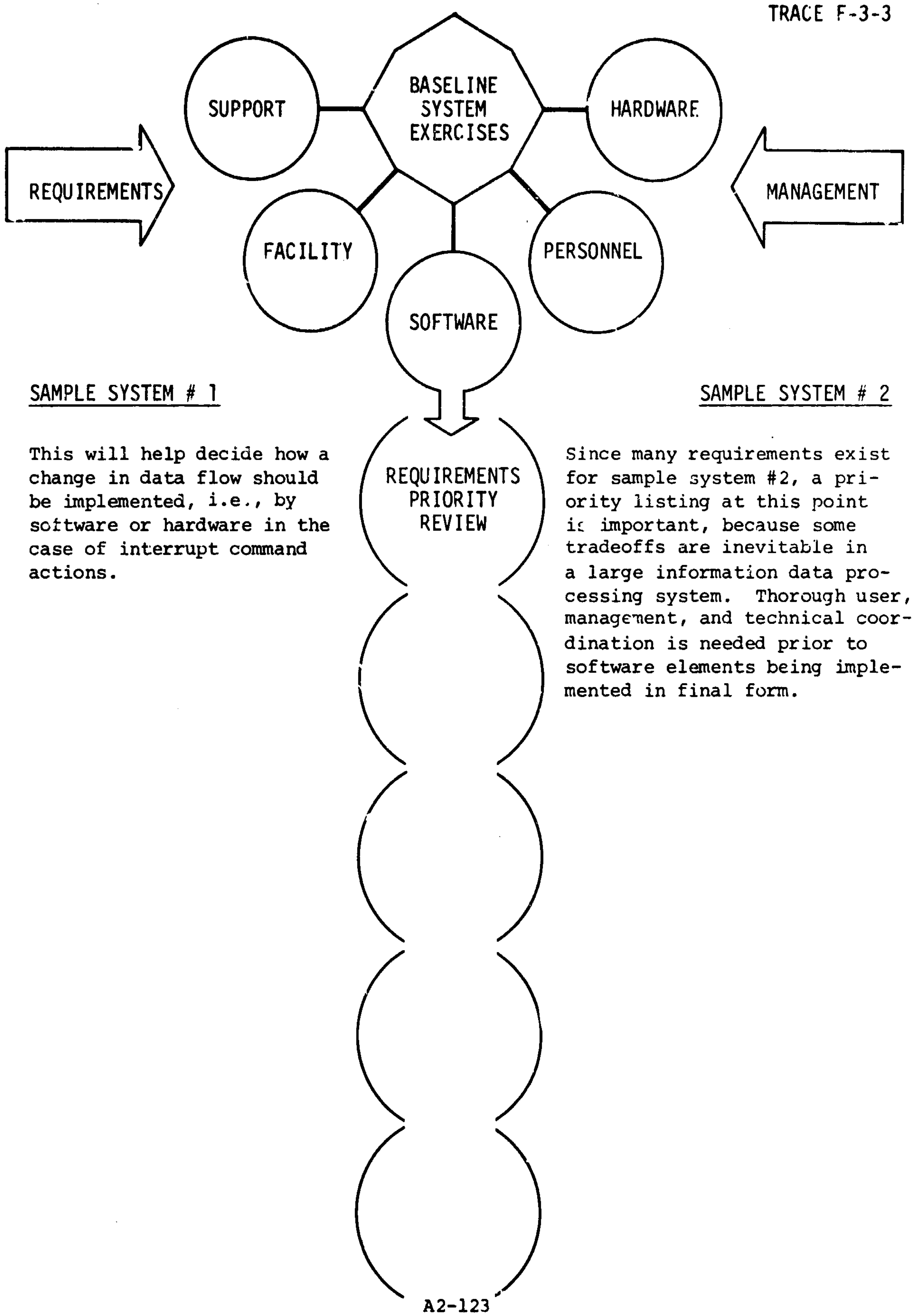
This check helps validate the application programs for sample system #1.

SAMPLE SYSTEM # 2

All the separate software programs will have to be reviewed for their utility versus cost to have and use them in support of mission analysis. Even though some programs are very efficient in their own right, they may not contribute to the overall mission accomplishment.

This step is extremely important for assisting in the future completion of user-oriented software reference documentation for all parts of the system.

This step will affect the application programs and file management programs primarily. Any changes in data flow will cause a corresponding change in application programs where multiple, on-line operations are being performed. This should be carefully analyzed at this time so that re-programming can begin at once if needed.

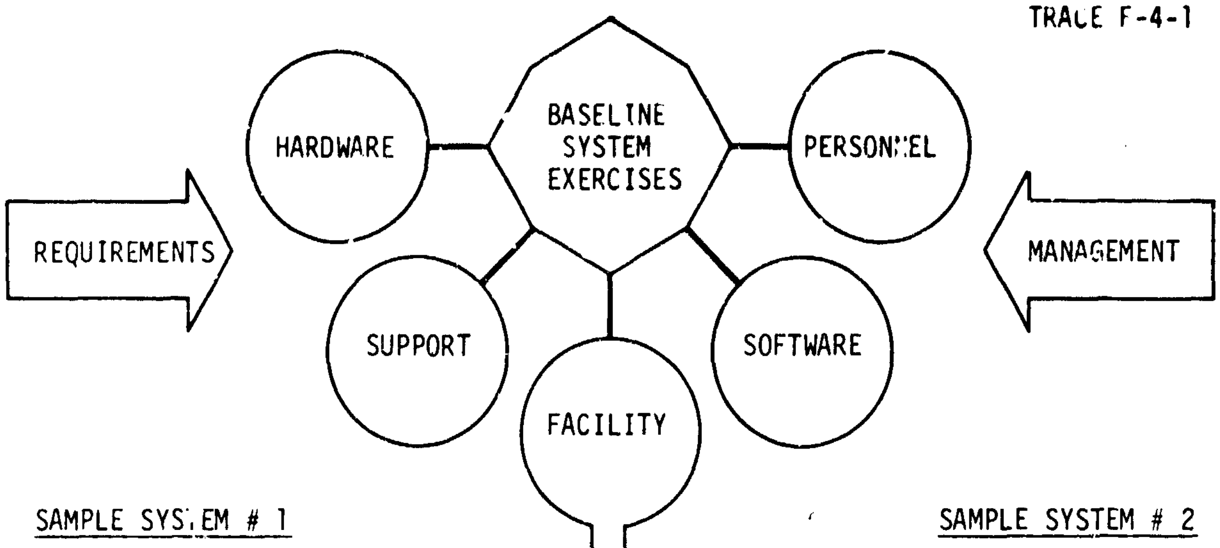


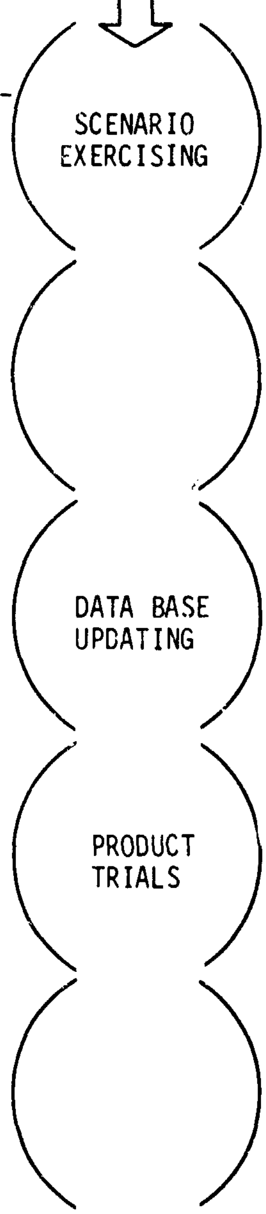
<u>SAMPLE SYSTEM # 1</u>

This will help decide how a change in data flow should be implemented, i.e., by software or hardware in the case of interrupt command actions.

<u>SAMPLE SYSTEM # 2</u>

Since many requirements exist for sample system #2, a priority listing at this point is important, because some tradeoffs are inevitable in a large information data processing system. Thorough user, management, and technical coordination is needed prior to software elements being implemented in final form.





SAMPLE SYSTEM # 1

This step will not affect the facility elements significantly for sample system #1.

This step will not affect the facility elements for sample system #1.

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SAMPLE SYSTEM # 2

This step is important in order to check the internal layout of the facility and to help develop standard operating procedures to be followed. These will be used when the facility is ready for production operations.

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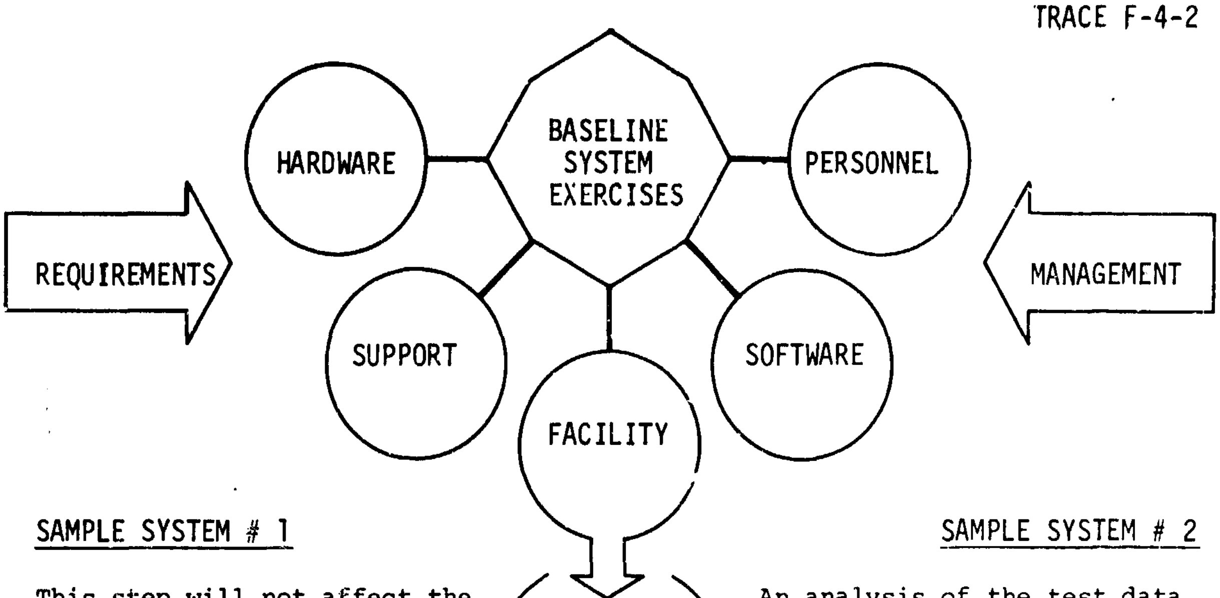
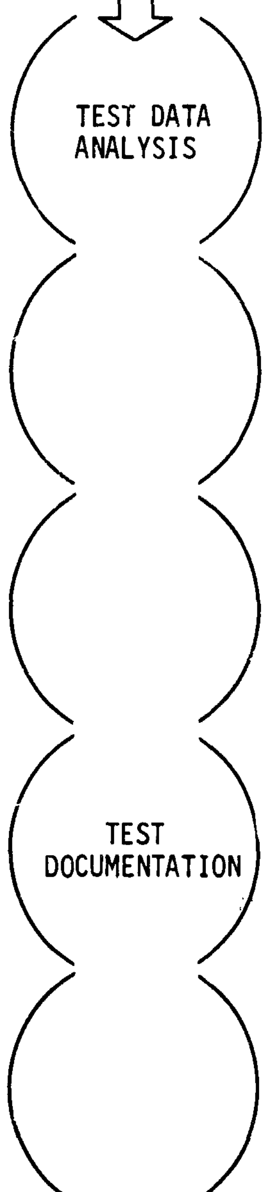




SAMPLE SYSTEM # 1

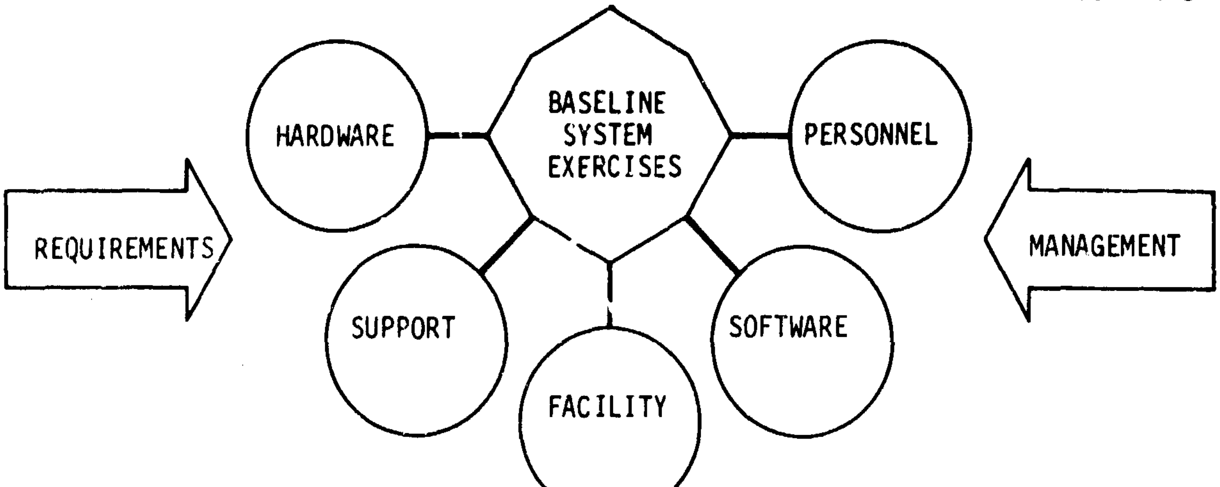
This step will not affect the facility elements for sample system #1.

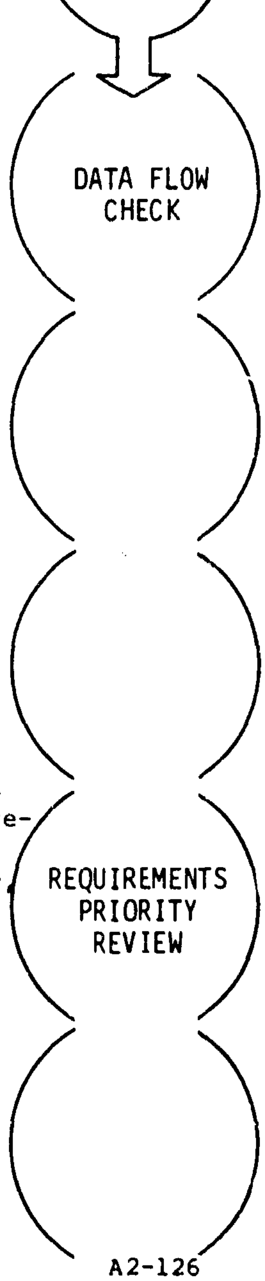
This step will not affect the facility elements for sample system #1.

SAMPLE SYSTEM # 2

An analysis of the test data should be performed against all aspects of the facility at this point. Elements such as security safeguards, optimum partition layout, safety accommodations, and expansion capability should be reviewed now that the full system activity has been exercised and results have been coordinated with management. As outside groups are brought in to observe the system, a trend to change or expand the system frequently begins.

This will not affect the facility elements to a great extent except to record recommended modifications to engineering support personnel.





SAMPLE SYSTEM # 1

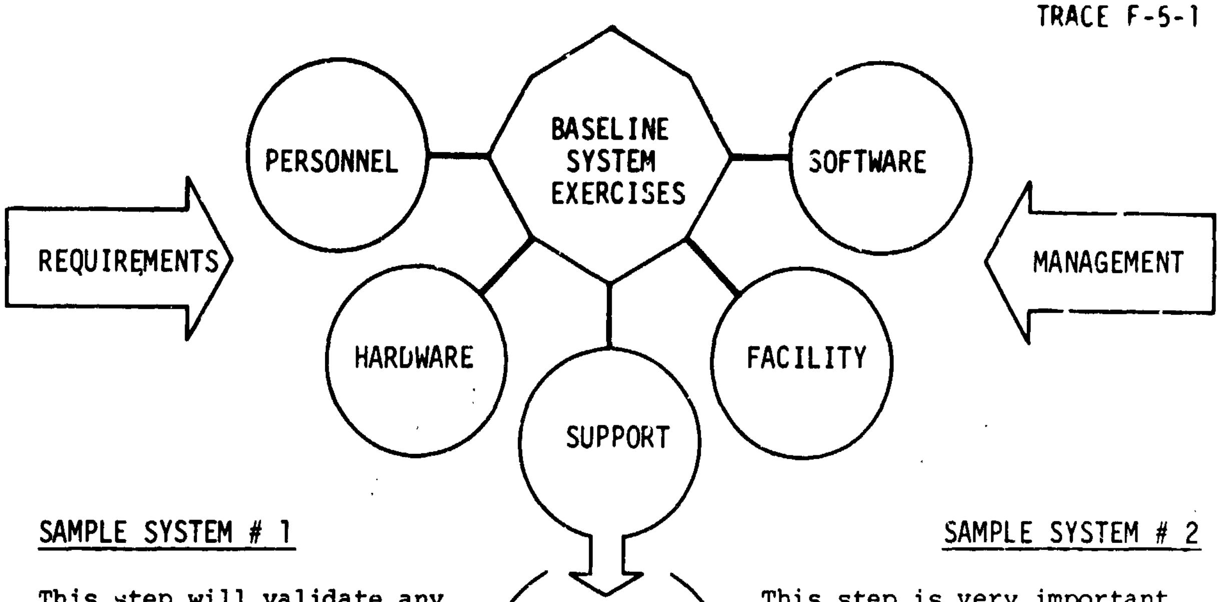
This step will not affect the facility elements for sample system #1.

By performing Baseline System Exercises there may be requirements developed that would affect the facility shielding, storage space limitation, etc., so this step should be accomplished as far as any last minute facility impact is concerned.

SAMPLE SYSTEM # 2

An analysis of the test data should be performed against all aspects of the facility at this point. Elements such as security safeguards, optimum partition layout, safety accommodations, and expansion capability should be reviewed now that the full system activity has been exercised and results have been coordinated with management. As outside groups are brought in to observe the system, a trend to change or expand the system frequently begins.

This step will help determine a schedule and the method to accomplish any facility modifications based on the current system requirements. This is necessary, because this step may occur many years after the initial facility design plan was prepared and construction steps were completed. Requirements do change significantly over time for most information processing systems.

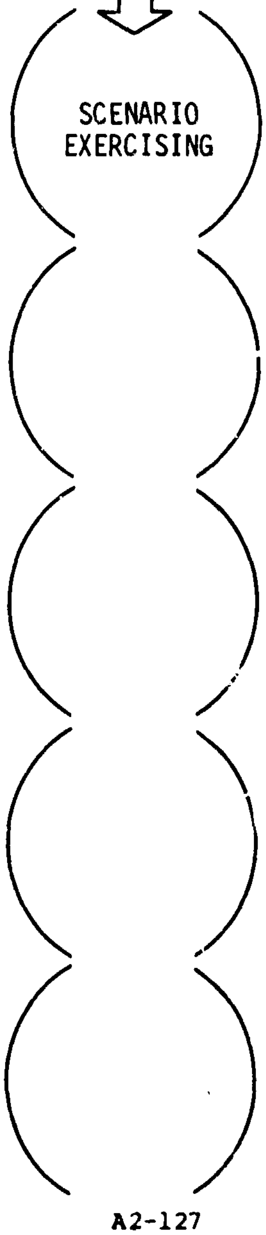


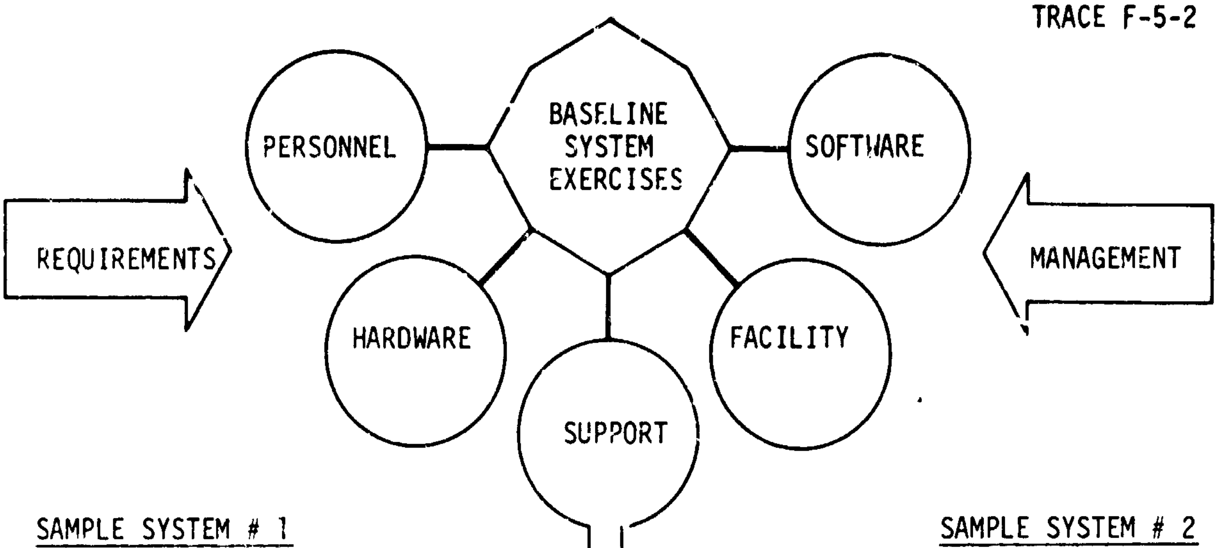
SAMPLE SYSTEM # 1

This step will validate any need for continual support for sample system #1. It should be a minor amount in this case.

SAMPLE SYSTEM # 2

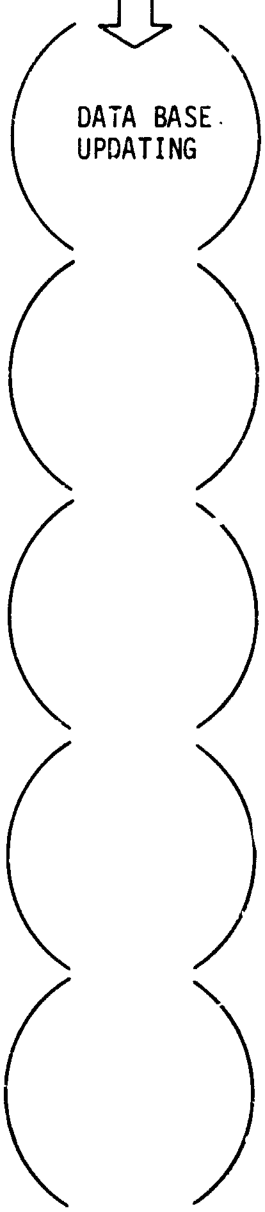
This step is very important to the support elements of such a large, complex system. The scenario will force the use of the kinds of supplies needed, point out spare parts needed, cause maintenance to be performed, and most importantly, identify software and other on-site or off-site service support needed for the system. This is one of the first opportunities for support organizations to observe and obtain an appreciation for the need of their services to the primary system-user organization.





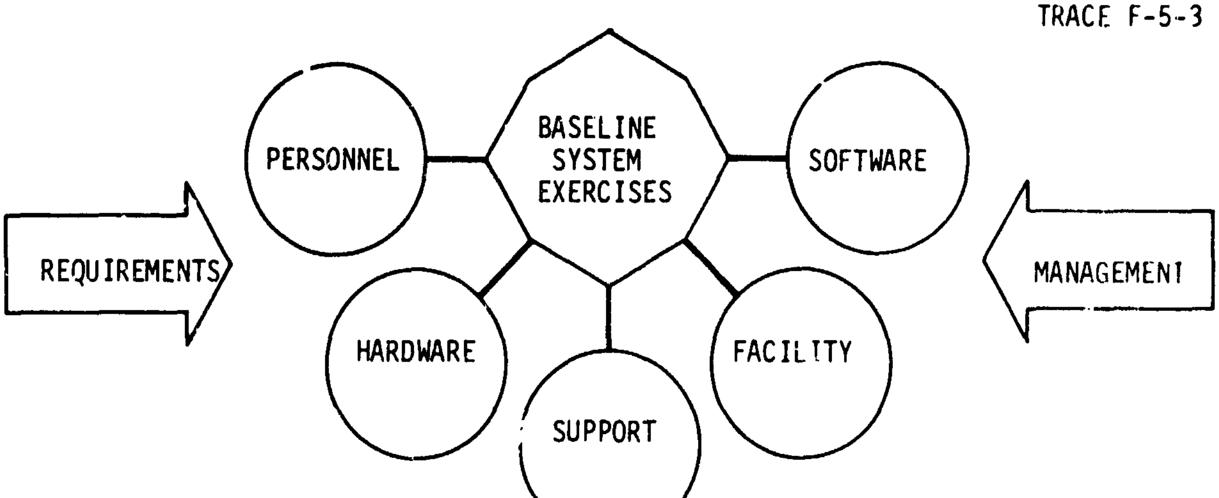
SAMPLE SYSTEM # 1

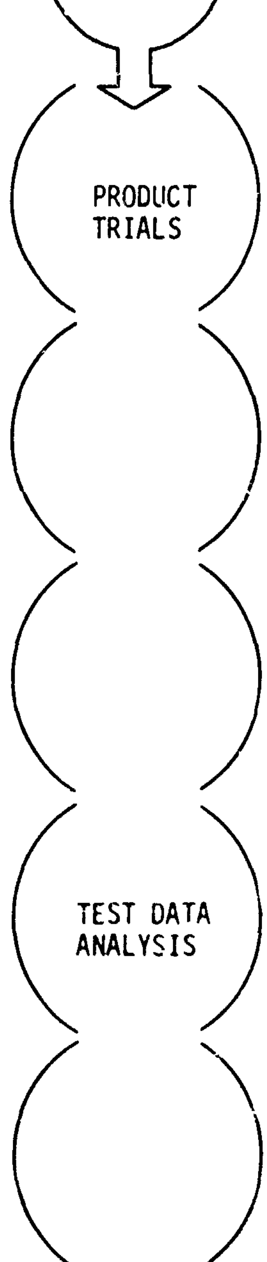
This step by itself will not affect support elements for sample system #1.



SAMPLE SYSTEM # 2

This step is very important to the support elements of such a large, complex system. The scenario will force the use of the kinds of supplies needed, point out spare parts needed, cause maintenance to be performed, and most importantly, identify software and other on-site or off-site service support needed for the system. This is one of the first opportunities for support organizations to observe and obtain an appreciation for the need of their services to the primary system-user organization.





SAMPLE SYSTEM # 1

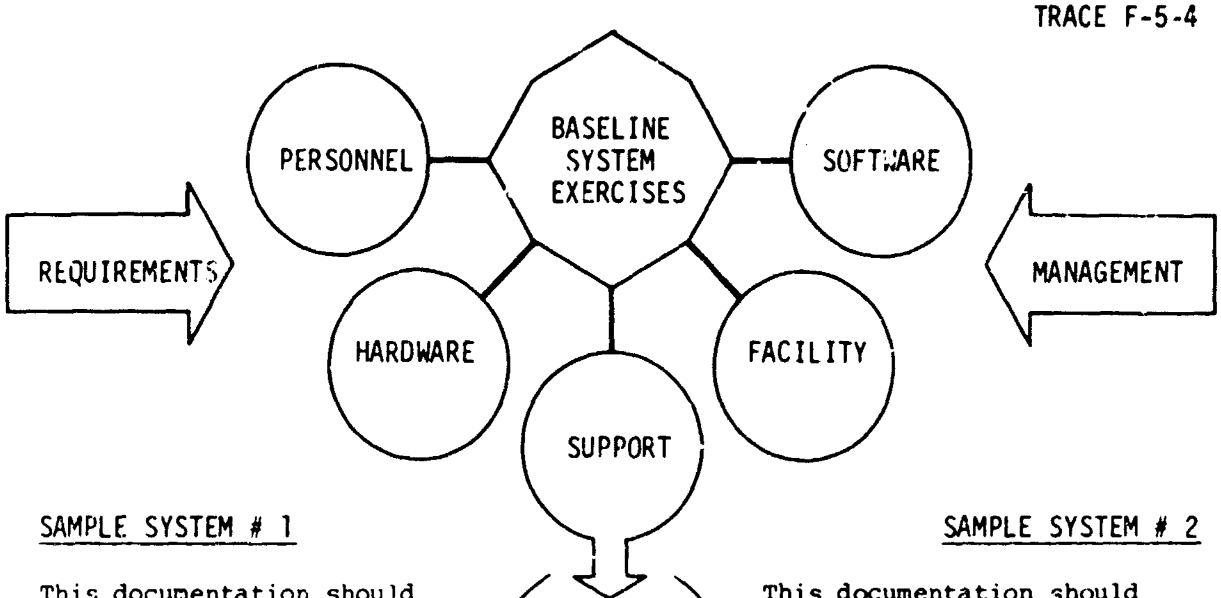
This step by itself will not affect support elements for sample system #1.

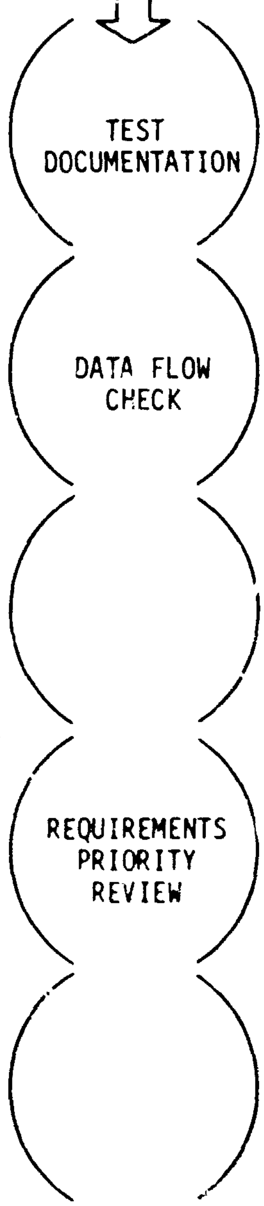
Maintenance, supplies, and spare parts support can be validated to some extent by this step. Future software support will be indicated also.

SAMPLE SYSTEM # 2

This step is very important to the support elements of such a large, complex system. The scenario will force the use of the kinds of supplies needed, point out spare parts needed, cause maintenance to be performed, and most importantly, identify software and other on-site or off-site service support needed for the system. This is one of the first opportunities for support organizations to observe and obtain an appreciation for the need of their services to the primary system-user organization.

Maintenance, supplies, and spare parts support can be validated to some extent by this step. Future software support will be indicated also.





SAMPLE SYSTEM # 1

This documentation should serve as guidance data for support elements acquisition during the next task of Final Implementation.

This step will not affect the support elements of sample system #1.

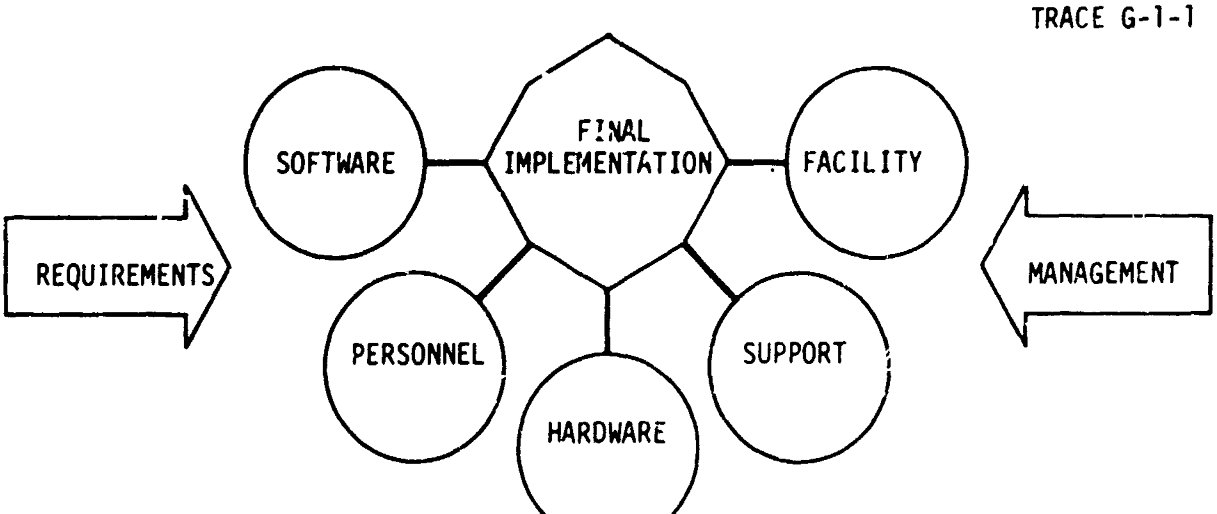
This step will not affect the support elements of sample system #1.

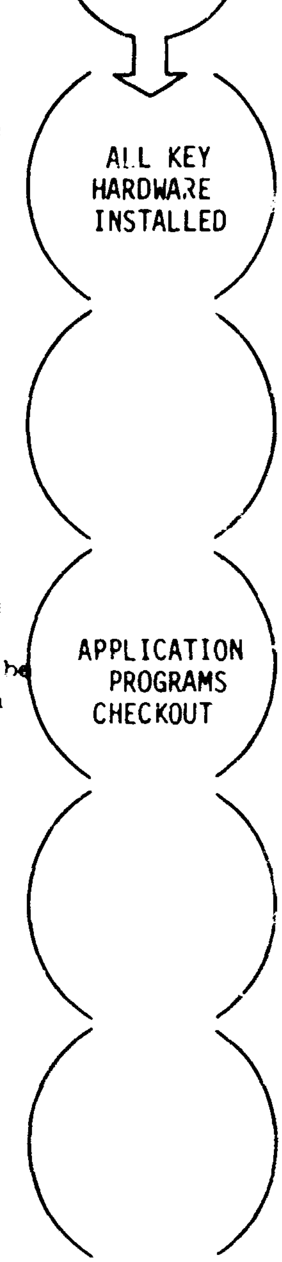
SAMPLE SYSTEM # 2

This documentation should serve as guidance data for support acquisition during the next task of Final Implementation.

This step could affect the support decisions to be implemented if any significant data flows are adjusted which change supply, equipment spares, or maintenance needs. Also, reference documentation support work must be coordinated if data flows are changed.

This step will help schedule and place priorities on certain support activities prior to the implementation task in case funding or other limitations are forced on the system development or operational production efforts in the future.





SAMPLE SYSTEM # 1

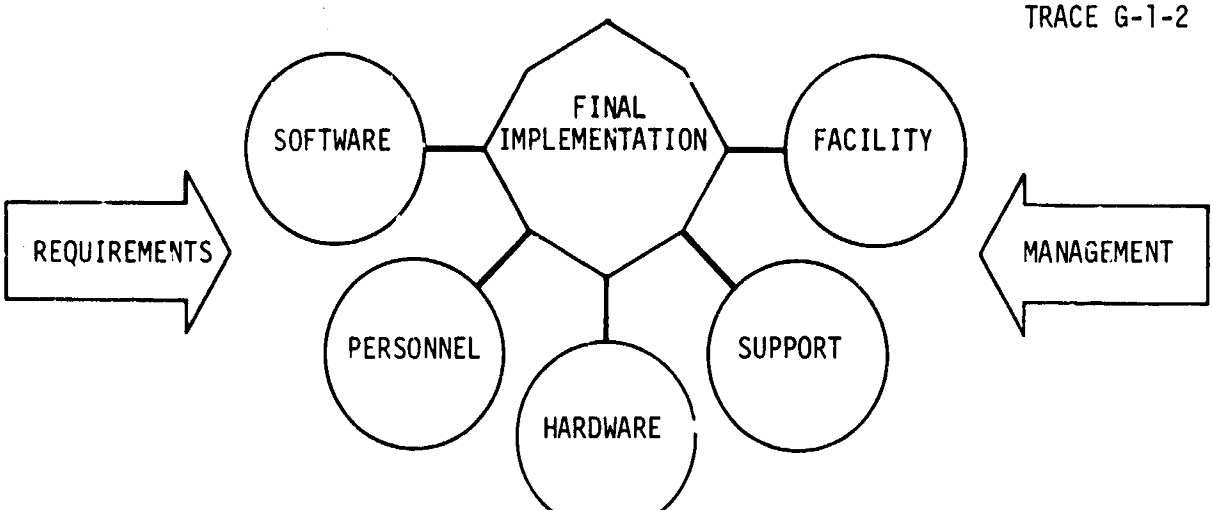
This step would probably be accomplished during Baseline Implementation for a small system. This step will not be applicable for sample system #1.

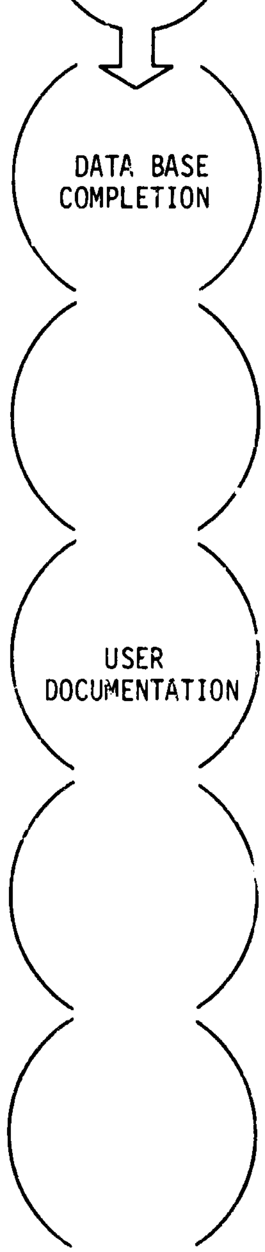
This step would probably be accomplished during Baseline Implementation for a small system. This step will not be applicable for sample system #1.

SAMPLE SYSTEM # 2

During this period, the proper numbers of equipments and individual hardware components that allow Tactical Mission Analysis to be accomplished should be installed. Some of the more advanced components may not yet be available, but all primary items to allow every function to be accomplished should be on-site, and hardware production activity should begin at contractor facilities at this time on most multiple-copy items.

Any on-line, input/output hardware element changes must be coordinated with the application software effort and vice versa. This step will be a significant activity at this time in such a large information processing system.





SAMPLE SYSTEM # 1

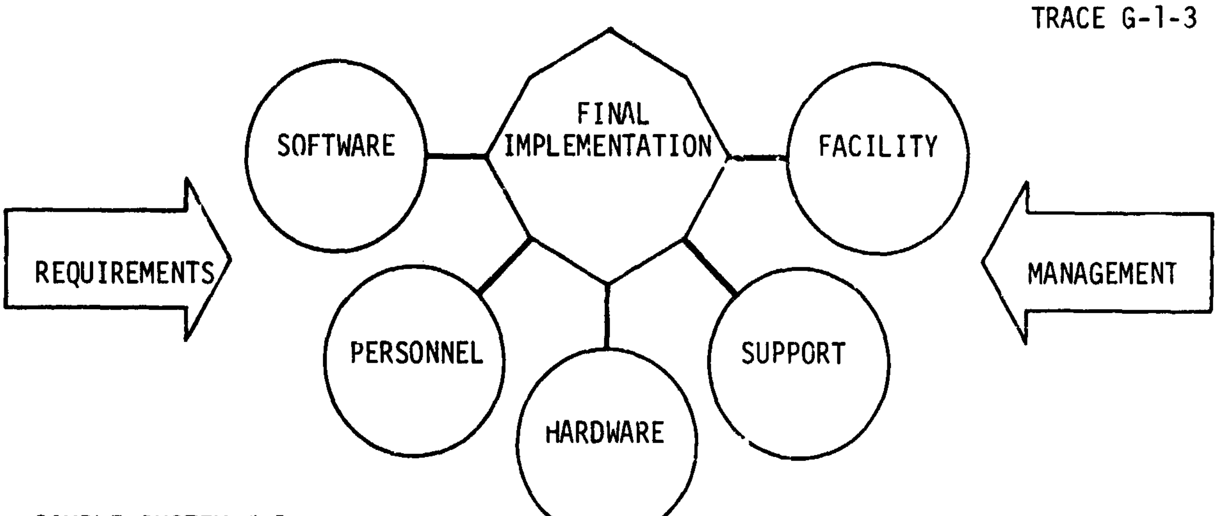
This step would probably be accomplished during Baseline Implementation for a small system. This step will not be applicable for sample system #1.

This step is usually not complete enough prior to some exercising of the system. In this sample system, the hardware-oriented user-documentation should be finished at this point if it is not already complete.

SAMPLE SYSTEM # 2

The data base building effort will most likely still be going on and the newly installed hardware will be used on an increasing scale to perform this function as soon as possible. Careful monitoring of this activity should be maintained to assure that production items are properly specified, because some changes may develop as more experience is gained in this area of data input under varied conditions.

User reference documentation for hardware operation, maintenance, procurement support, etc., should be completed during this period. This step should not be slighted at this time. The lack of proper user reference documentation can adversely affect all future tasks.



SAMPLE SYSTEM # 1

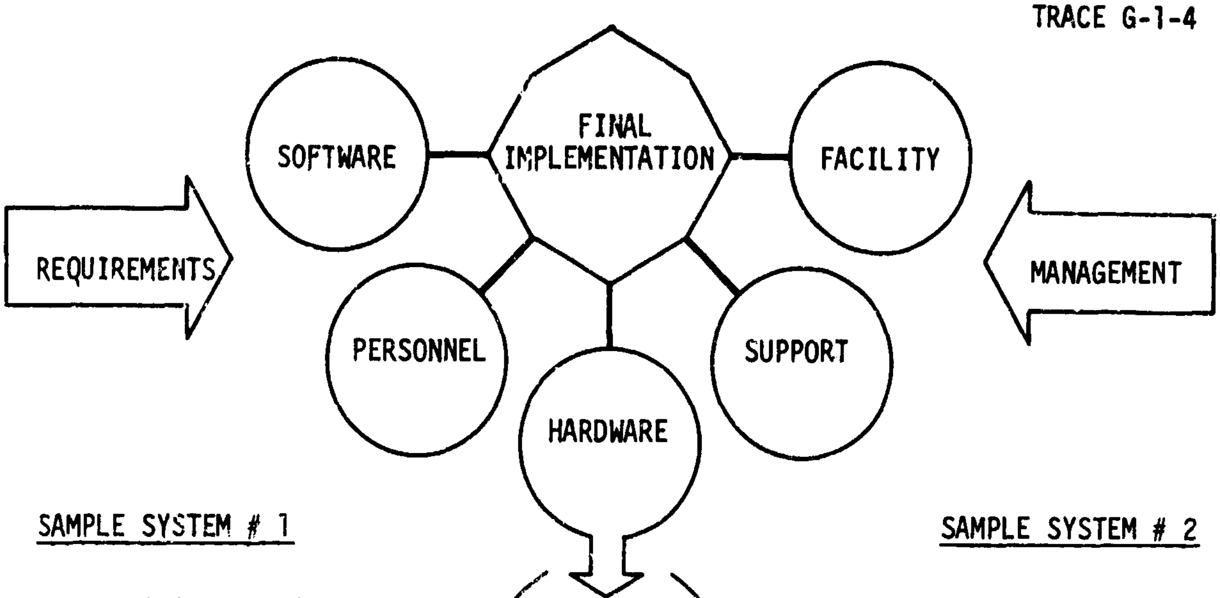
Any expansion plans should be identified by now if they are to be implemented between Baseline Exercises and Operational Acceptance Tasks. In this sample system, more consoles might be added, but the computer hardware and software support would have to be re-examined.

This step is not applicable as far as hardware elements are concerned for sample system #1.

SAMPLE SYSTEM # 2

Any system expansion plans should be integrated into hardware production changes at this time if possible. Often, these expansion actions must take the place of replacement or additional hardware terminals in a system such as this. Then, the computer components supporting the terminals must be carefully analyzed for capability. Other functional hardware that is off-line can come in anytime.

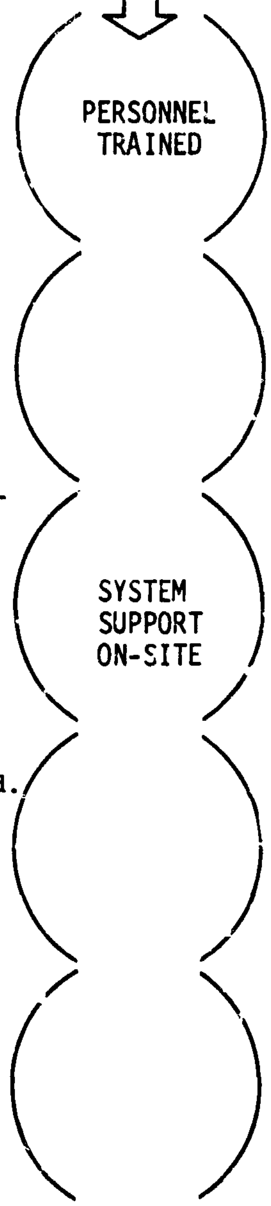
This step is necessary if the total inventory of hardware is to be efficiently used as soon as possible. Much equipment is wasted due to improper facility preparations to house the items so that the specified data flow can be implemented.



SAMPLE SYSTEM # 1

Any training required should occur during this period, and if the contractor performed this at his facility, it could involve a second display console on a rental or loan basis. The actual hardware elements of this system would not be changed because of this step.

Final plans for hardware support should be arranged at this time. However, unless it is discovered that a key spare part or supply item is unavailable or out of production, the hardware elements, which is the display console in this sample system, would not be affected.

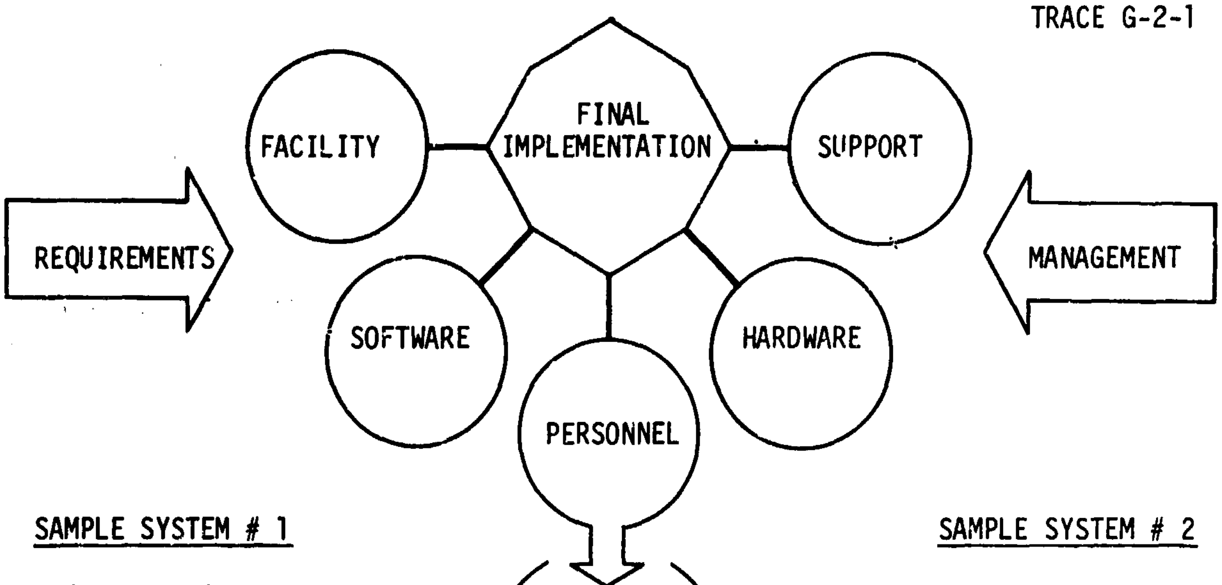


SAMPLE SYSTEM # 2

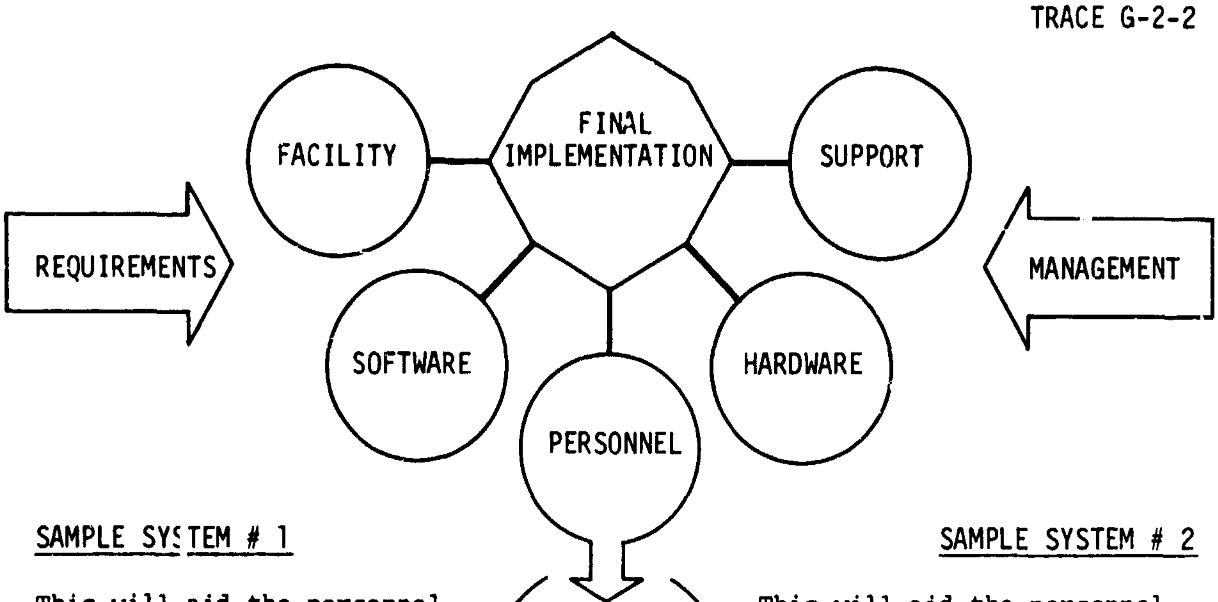
Hardware training for operator and maintenance personnel is important. The numbers of people needed should be trained in time so that maximum utility can be gained from the on-site system as soon as possible.

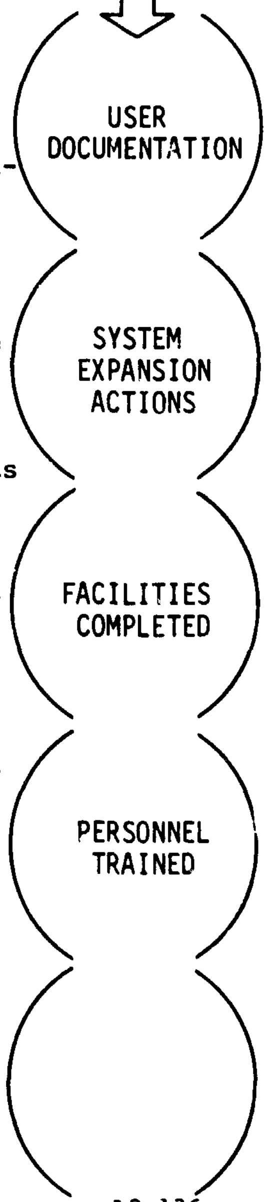
This is a significant step for a large system remote from the manufacturers' plants. The type of support to use for supply, maintenance, spare parts, documentation, software, etc., must be acquired at this time for production operations to begin with smooth transition. It is better to be over-committed in this area at the beginning than lacking in hardware support elements.

TRACE G-2-1



SAMPLE SYSTEM # 1		SAMPLE SYSTEM # 2
This step will not be applicable for sample system #1, because the effort that would be done here was completed during Baseline Implementation.	ALL KEY HARDWARE INSTALLED	This affects personnel staffing and all support personnel directly. As soon as all the system hardware is installed and uses are made of it, the operational staff begins improving their coordinated activity and discovering new methods of working as an effective team. Training needs and support element needs are all decreased by the increase in competence of the operating staff.
Even though the hardware is all installed, there frequently is more of this activity to accomplish. If so, this will require some training and personnel coordination at a minimum.	APPLICATION PROGRAMS CHECKOUT	Even though the hardware is all installed, there frequently is more of this activity to accomplish. If so, this will require some training and personnel coordination at a minimum.
This may cause a decrease in manning requirements from earlier tasks if this effort is finished during Final Implementation.	DATA BASE COMPLETION	This may cause a decrease in manning requirements from earlier tasks if this effort is finished during Final Implementation.





SAMPLE SYSTEM # 1

This will aid the personnel reference research efforts connected with operation, training, and maintenance, but this step is often considered as a support element.

This would affect staffing levels for this system if the man-machine stations were increased in number. If more and different functions were added to the system, it would also affect all elements of personnel.

This step would not affect personnel elements for sample system #1.

This would affect the personnel activities directly and might reduce the number of people assigned to work on the system. This culminates the training aspects of personnel elements for a system.

SAMPLE SYSTEM # 2

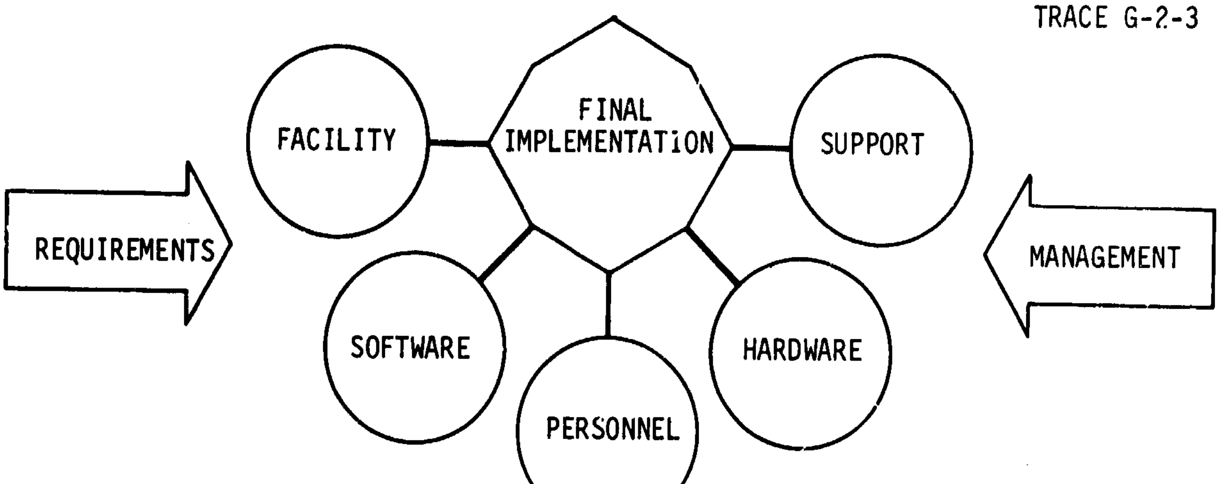
This will aid the personnel reference research efforts connected with operation, training, and maintenance, but this step is often considered as a support element.

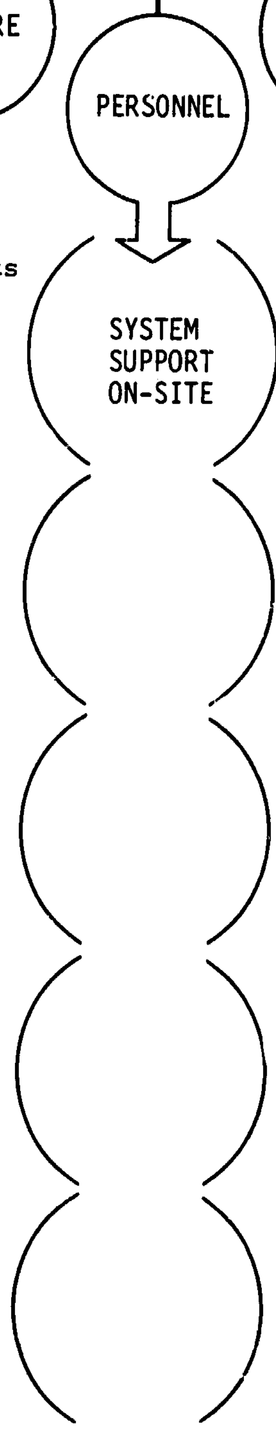
This would affect staffing levels for this system if the man-machine stations were increased in number. If more and different functions were added to the system, it would also affect all elements of personnel.

The number of personnel assigned to the system's operation may change as the facility is completed. Personnel turnover may also decrease.

This would affect the personnel activities directly and might reduce the number of people assigned to work on the system. This culminates the training aspects of personnel elements for a system.

TRACE G-2-3



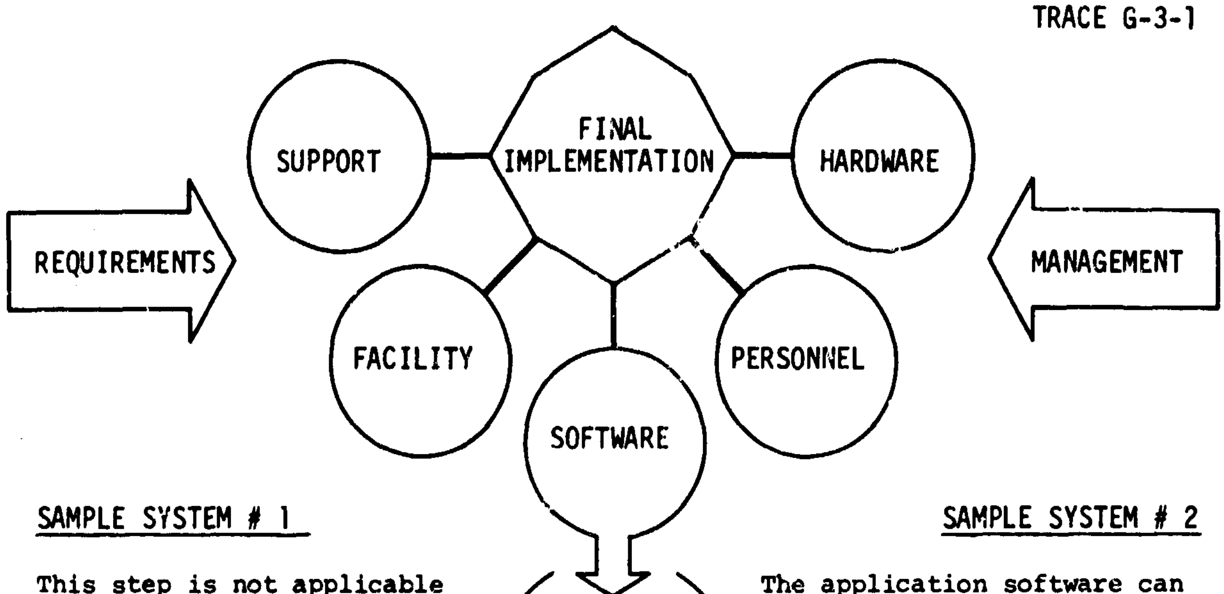


SAMPLE SYSTEM # 1

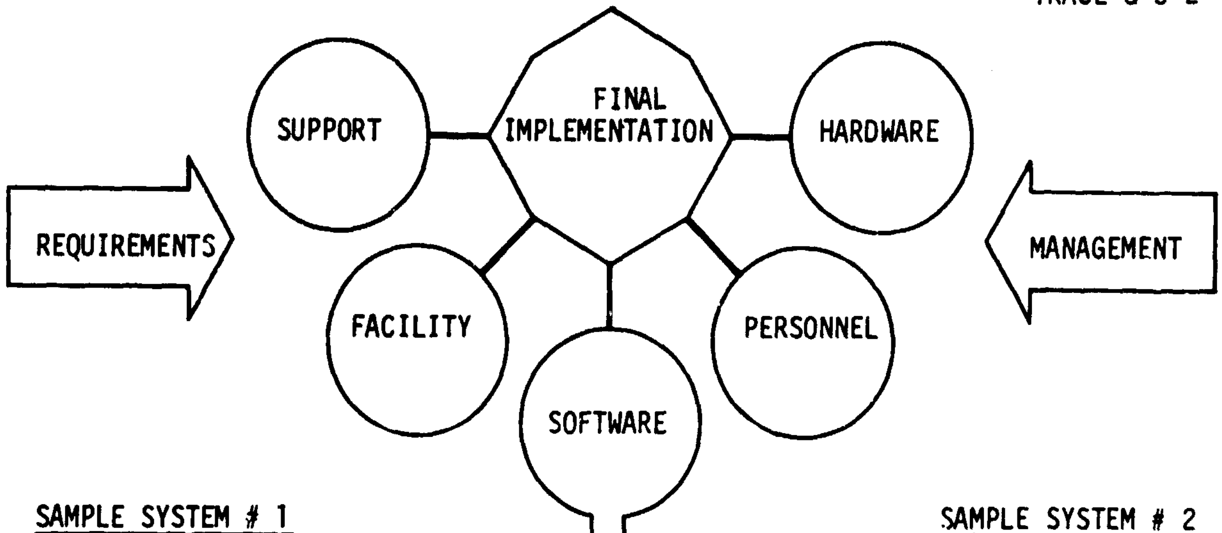
This would have minor effects on personnel elements for sample system #1.

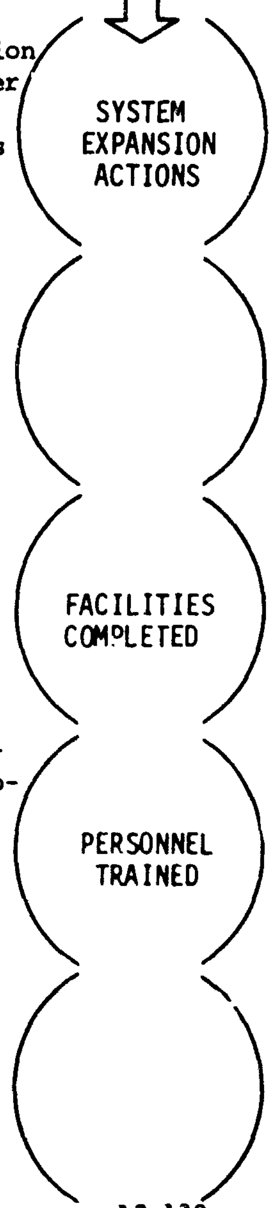
SAMPLE SYSTEM # 2

This could change the mix of government versus contractor personnel or could affect the movement of some of the support personnel from contractor or remote government development facilities to the operational site.



SAMPLE SYSTEM # 1		SAMPLE SYSTEM # 2
This step is not applicable for sample system #1 since all the equipment was installed during Baseline Implementation.	ALL KEY HARDWARE INSTALLED	The application software can only be checked out after all representative on-line equipments are installed unless the EDP system is duplicated elsewhere. The file management system can only be validated in this same mannner.
This step may be a continuing one and directly affects the resultant software capability.	APPLICATION PROGRAMS CHECKOUT	This step may be a continuing one and directly affects the resultant software capability.
This step helps check out the application software completely and confidently.	DATA BASE COMPLETION	This step helps check out the application software completely and confidently. It is also necessary for checking the file management system programs.
This step aids in any software modifications or additions to the application program library. It is very important to have a complete and accurate product from this step for all software.	USER DOCUMENTATION	This step aids in any software modifications or additions to the application program library. It is very important to have a complete and accurate product from this step for all software.





SAMPLE SYSTEM # 1

This may affect the application programs needed. The computer support component in this sample system should have its system software re-evaluated if this step is taken.

This step will not affect software elements for sample system #1.

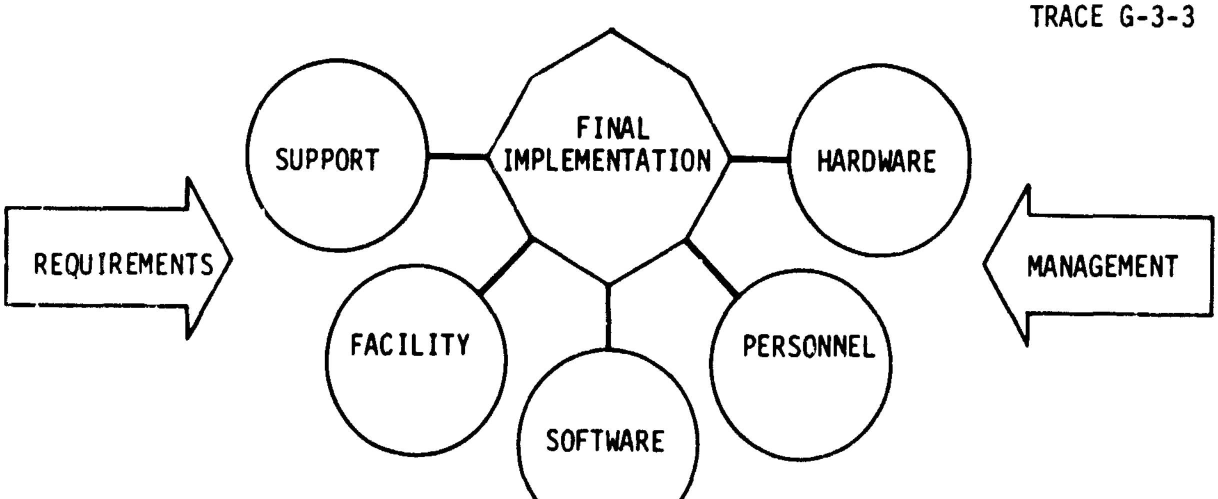
This step will be better performed if the application programs are completed; however, the software elements will not be affected by this unless the personnel who are trained are to be working on new application programs or changes to old ones.

SAMPLE SYSTEM # 2

This may affect the application programs needed. The computer support component in this sample system should have its system software re-evaluated if this step is taken. Other off-line equipments may be added or modified also. If so, the data flows should be re-examined to assure that the on-line and batch data processing support needs are the same. If not, new software may be needed.

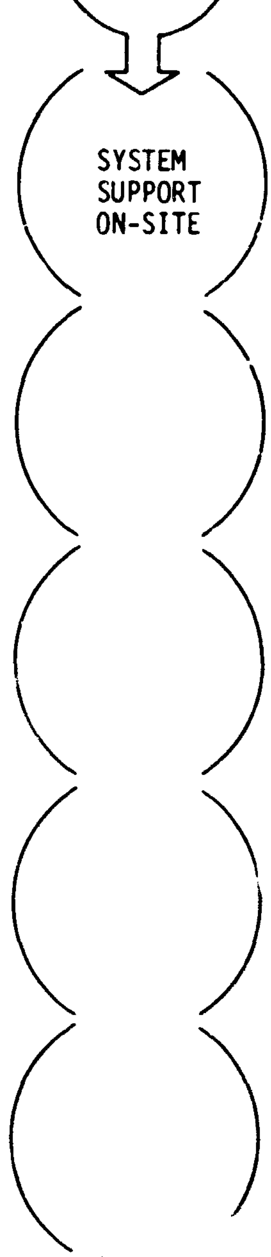
This step will not affect software elements for sample system #1.

This step will be better performed if the application programs are completed; however, the software elements will not be affected by this unless the personnel who are trained are to be working on new application programs or changes to old ones. Sometimes, improvements in system software can be planned as personnel become more available to implement them.



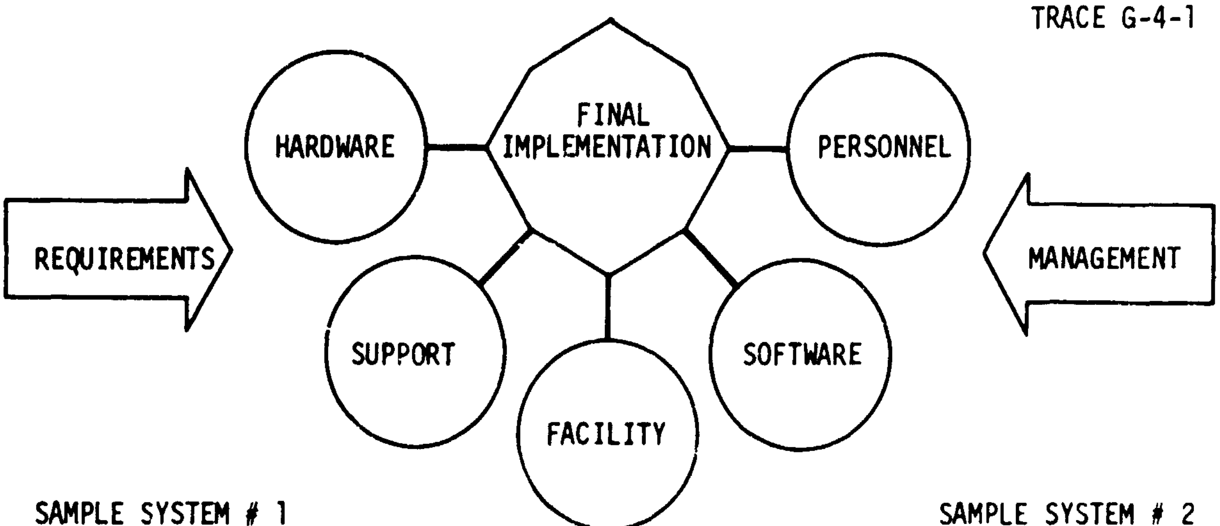
SAMPLE SYSTEM # 1

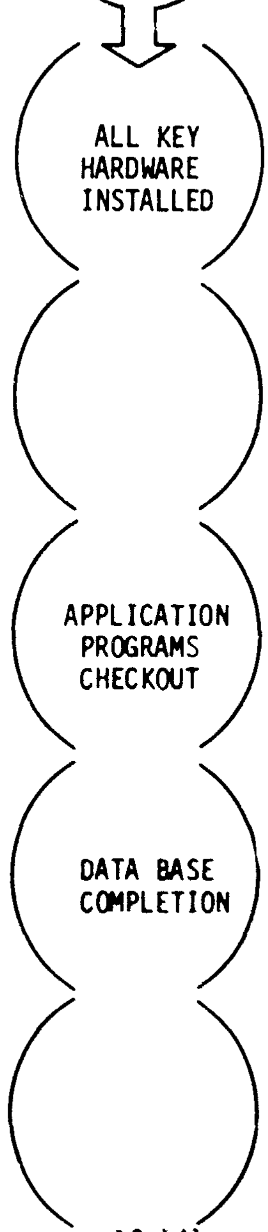
Supplies and working space may be provided for support programmers if required at this point or at some future time.



SAMPLE SYSTEM # 2

Supplies and working space may be provided for support programmers if required at this point or at some future time.





SAMPLE SYSTEM # 1

SAMPLE SYSTEM # 2

ALL KEY HARDWARE INSTALLED

Sample System # 1: This step will not be applicable for sample system #1.

Sample System # 2: Final facility finishing work or decoration may be completed. Also the cable ducting, safety exits, and telephone lines can be finalized if not previously done. Sometimes special, large equipment requires extra-large openings that are sealed after the hardware has been installed.

APPLICATION PROGRAMS CHECKOUT

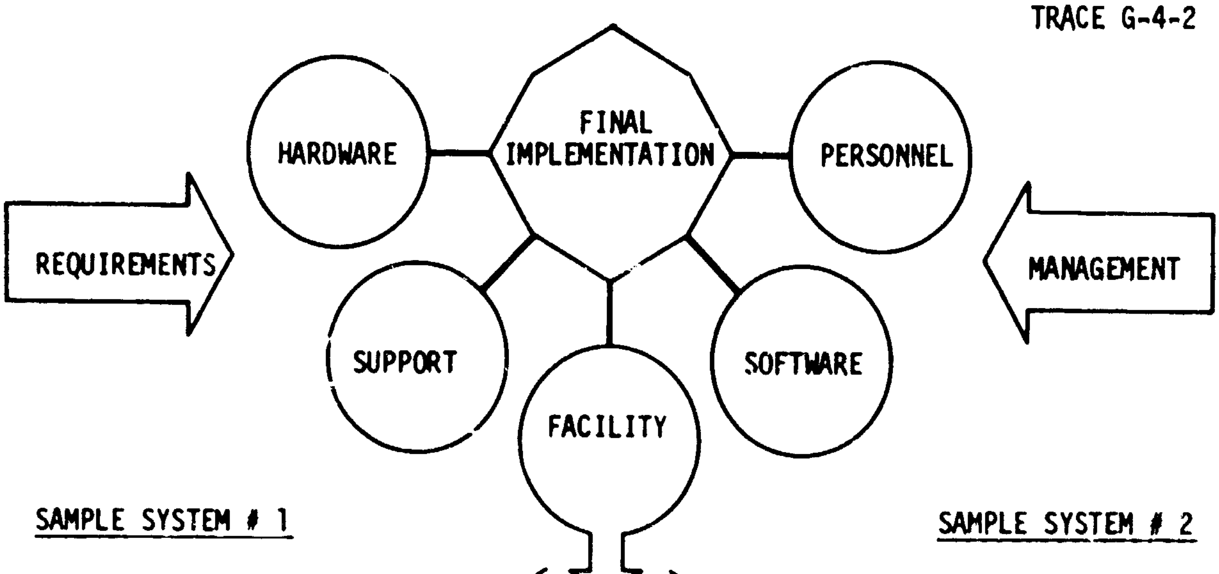
Sample System # 1: This step will not be applicable for sample system #1.

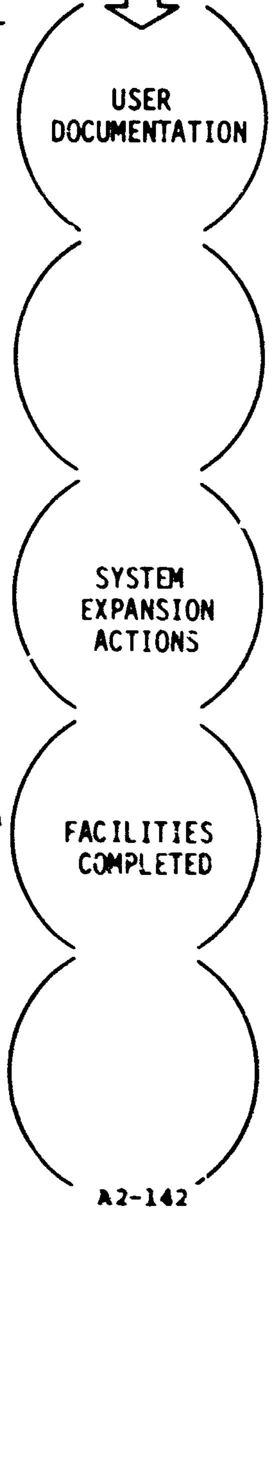
Sample System # 2: This step will not affect the facility elements for sample system #2, unless completion of this effort signals the fabrication of the housing for the system. This might be the case for shelterized, tactical systems that are developed in fixed facilities--then fielded.

DATA BASE COMPLETION

Sample System # 1: This step will not be applicable for sample system #1.

Sample System # 2: This step will not affect the facility elements for sample system #2 unless completion of this effort signals the fabrication of the housing for the system. This might be the case for shelterized, tactical systems that are developed in fixed facilities--then fielded.





SAMPLE SYSTEM # 1

This step will not be applicable for sample system #1.

If expansion is planned, the facility space, layout, or other characteristics may well have to change.

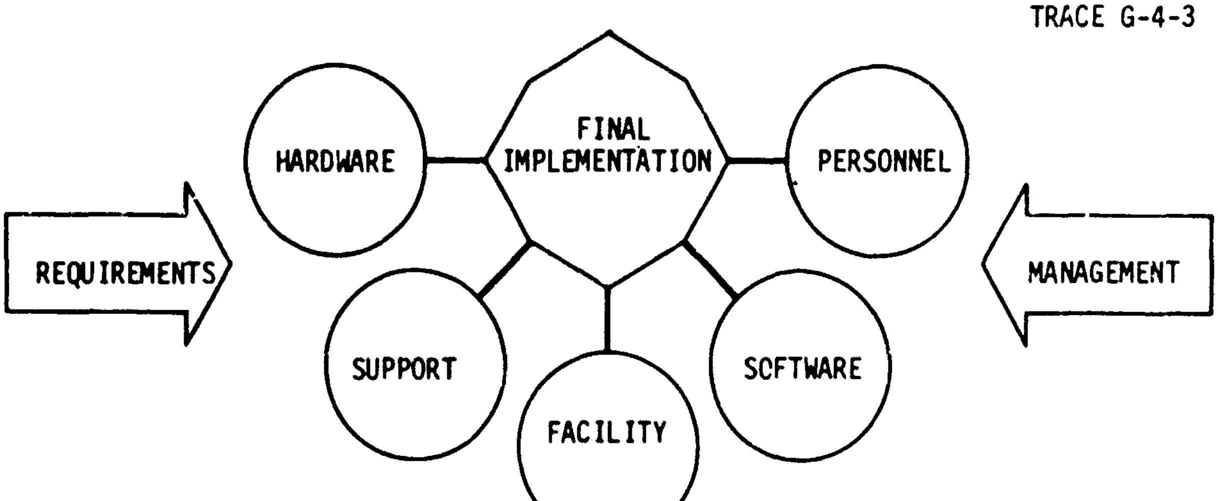
This generally culminates the facility element work in any system analysis, development, and/or implementation effort.

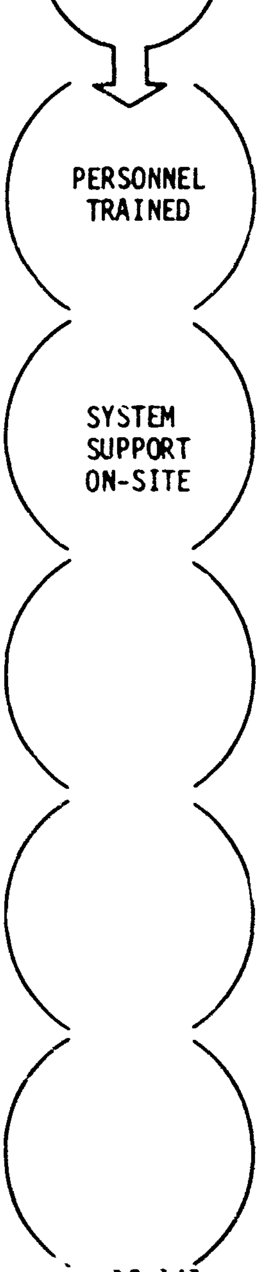
SAMPLE SYSTEM # 2

This step has little affect on facility elements unless the facility is a special-purpose shelter or complex of shelters requiring some action on the part of the users. Then, facility-related documentation about set-up, maintenance, adjustments, etc., may be appropriate.

If expansion is planned, the facility space, layout, or other characteristics may well have to change.

This generally culminates the facility element work in any system analysis, development, and/or implementation effort.





SAMPLE SYSTEM # 1

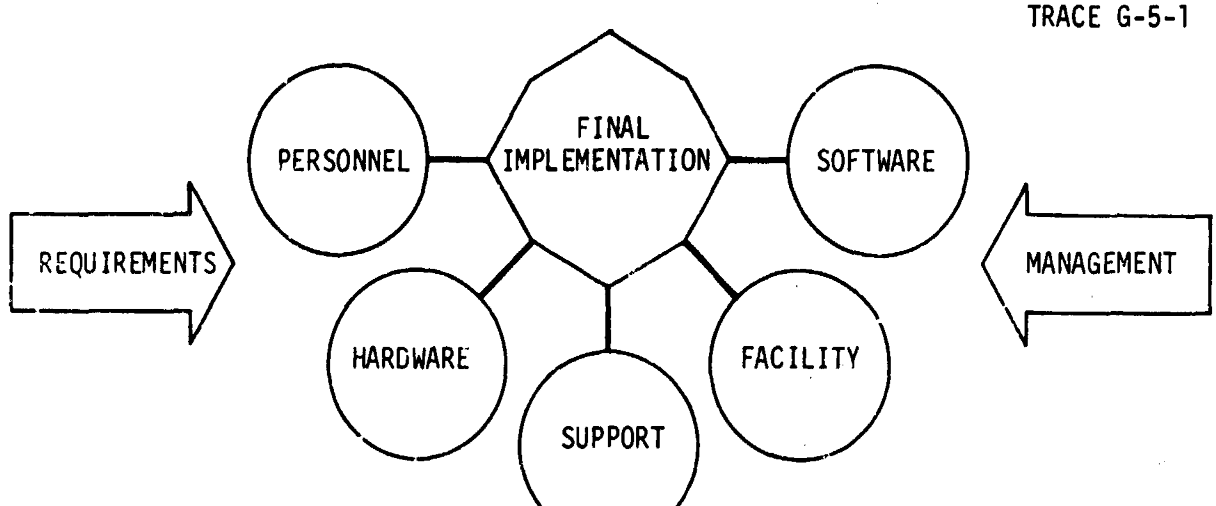
This step does not affect the facility elements for sample system #1.

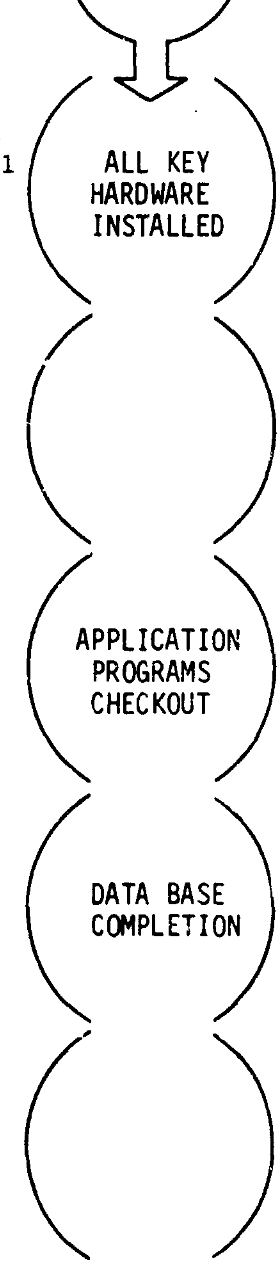
Space adjustments may have to be made as full support is appreciated or other external actions dictate requirements on the system's facility area.

SAMPLE SYSTEM # 2

This should not normally affect the facility elements unless fieldable, deployable shelter units are employed or the system is in a vehicle of some type.

Space adjustments may have to be made as the full support needs are appreciated or other external actions dictate requirements on the system's facility areas.





<u>SAMPLE SYSTEM # 1</u>

All support elements are needed soon after this point to assure desired operational utilization of the system.

The programming services, related supply, and space requirements which may be support elements in this case can be reduced at completion of this step.

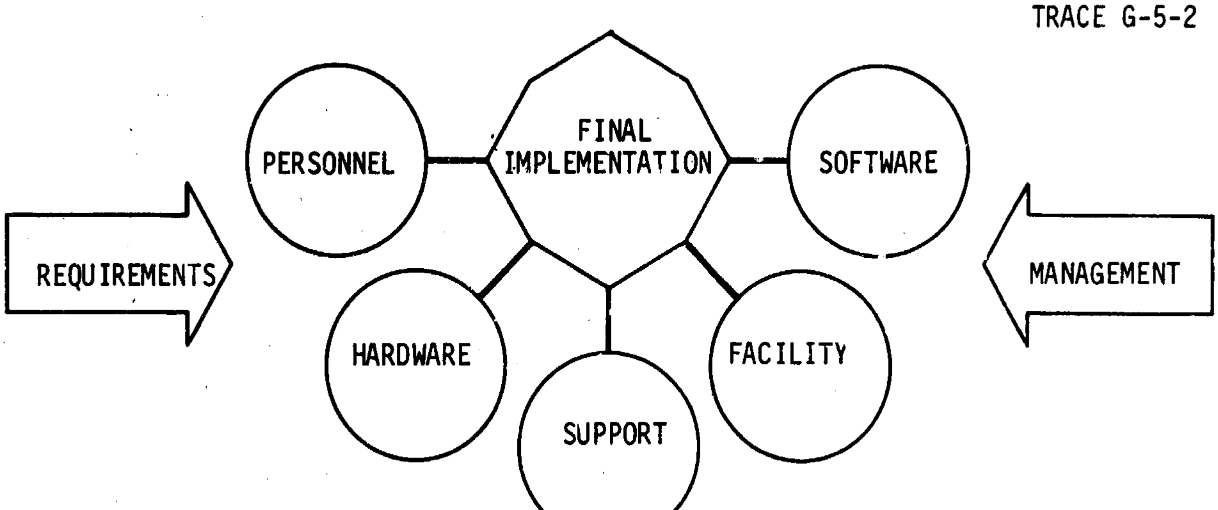
The programming services, related supply, and space requirements which may be support elements in this case can be reduced at completion of this step.

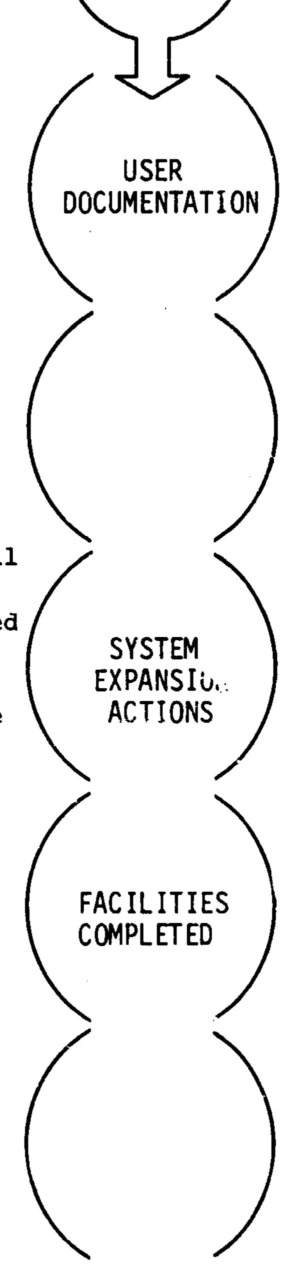
<u>SAMPLE SYSTEM # 2</u>

All support elements are needed soon after this point to assure desired operational utilization of the system. The larger the system and more varied the equipment, the more significant and time consuming is the support effort.

The programming services, related supply, and space requirements which may be support elements in this case can be reduced at completion of this step.

The programming services, related supply, and space requirements which may be support elements in this case can be reduced at completion of this step.





SAMPLE SYSTEM # 1

Contractor support on-site can often be reduced as complete, accurate documentation is made available and used.

These actions will affect all future support elements; therefore, the support needed for envisioned hardware, software, personnel, and facility expansion should be re-analyzed.

This step will cause minor effect to support elements unless more space than previously available is needed for some projected type of activity.

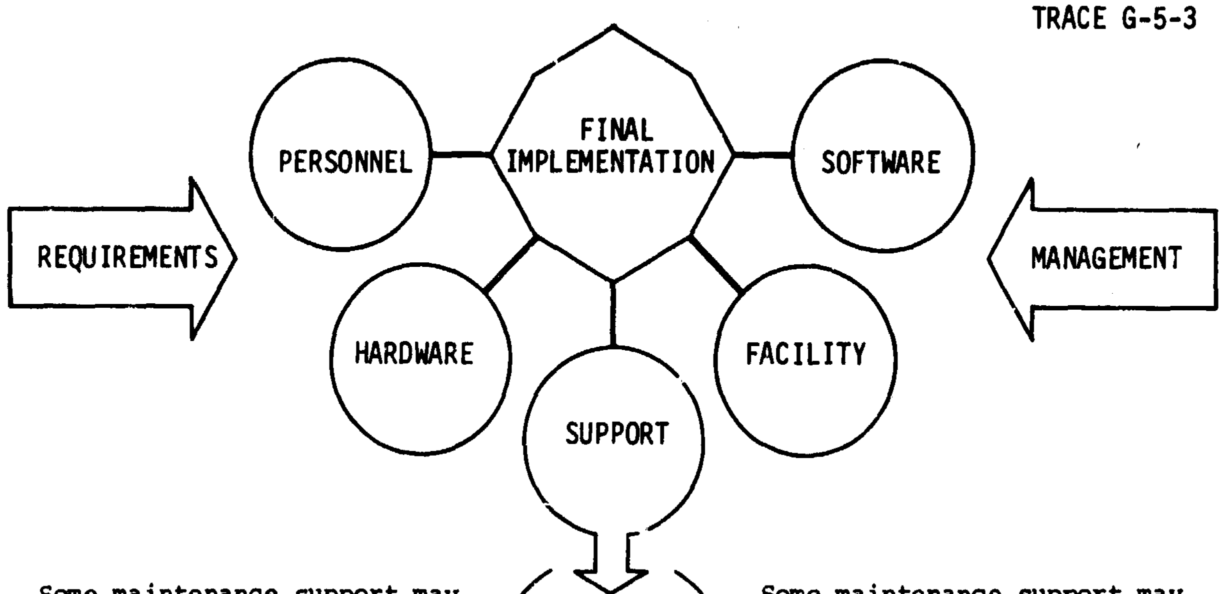
SAMPLE SYSTEM # 2

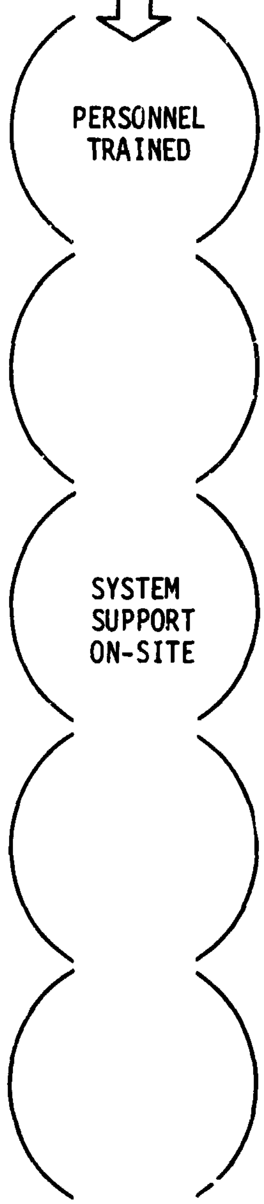
Contractor support on-site can often be reduced as complete, accurate documentation is made available and used. Close coordination is needed with training and procurement support agencies after this step is finished. It will also help them better handle their jobs.

These actions will affect all future support elements; therefore, the support needed for envisioned hardware, software, personnel, and facility expansion should be re-analyzed.

This step will cause minor effect to support elements unless more space than previously available is needed for some projected type of activity.

TRACE G-5-3



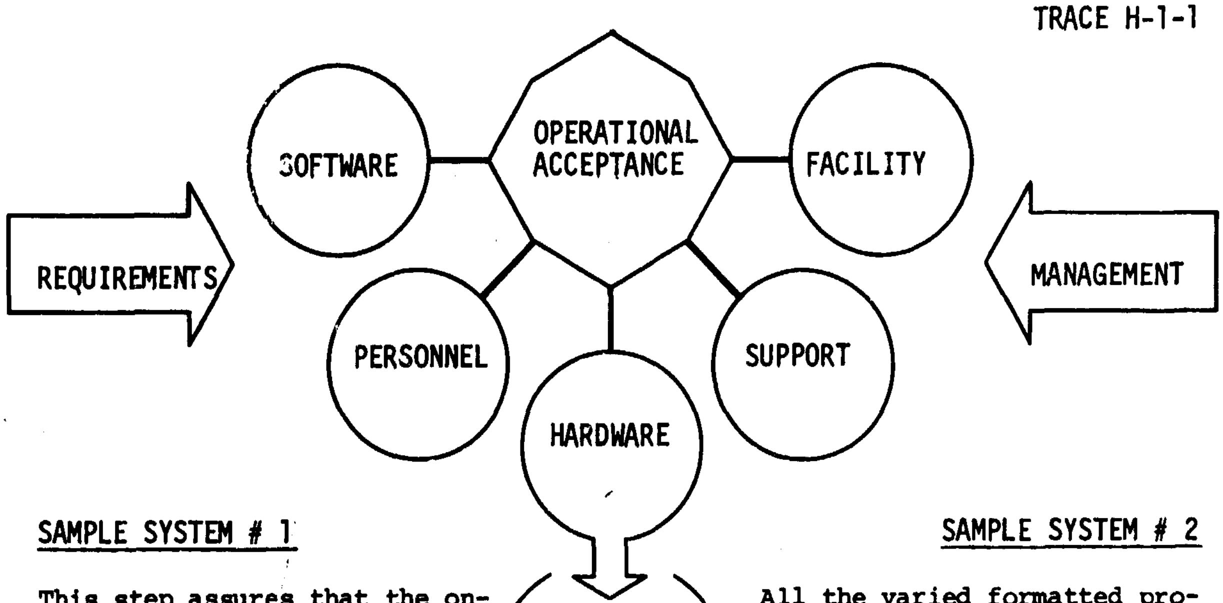


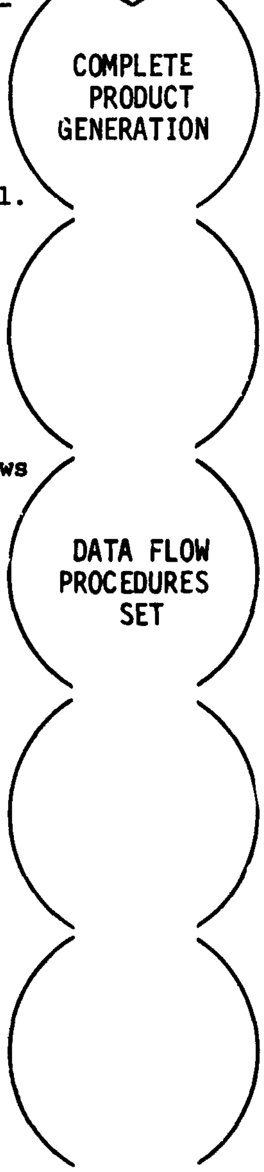
Some maintenance support may be reduced as the personnel to operate the system become fully trained and make fewer mistakes that cause damage to hardware. Fewer software support people are required also as the users become proficient in the man-machine procedures and with the system's logic.

Some maintenance support may be reduced as the personnel to operate the system become fully trained and make fewer mistakes that cause damage to hardware. Fewer software support people are required also as the users become proficient in the man-machine procedures and with the system's logic.

This generally culminates the definition of the support elements for any system analysis, development, and/or implementation effort.

This generally culminates the definition of the support elements for any system analysis, development, and/or implementation effort.





SAMPLE SYSTEM # 1

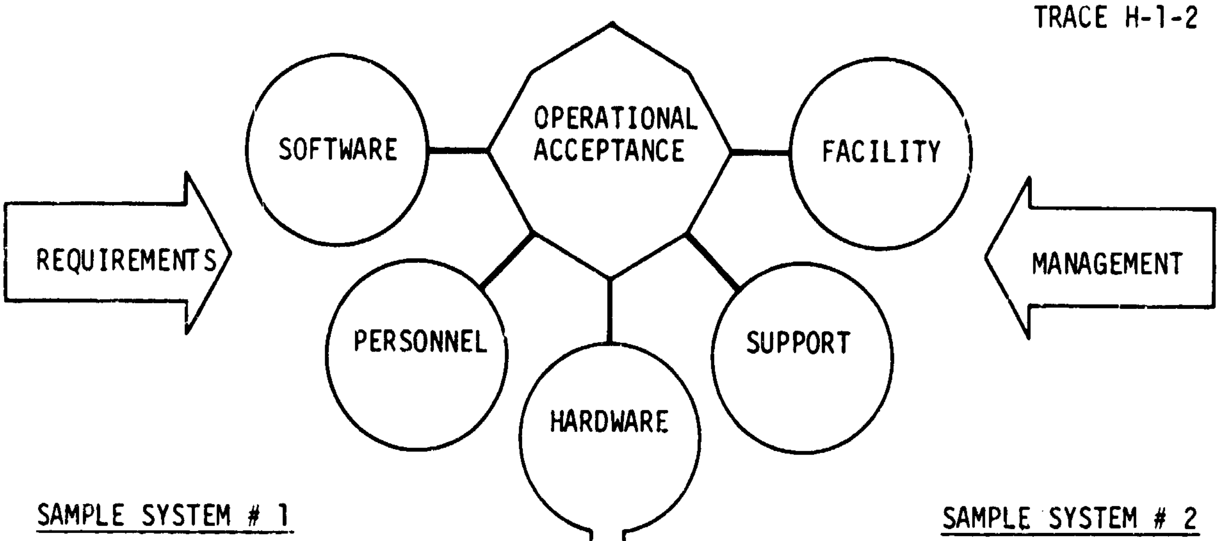
This step assures that the on-line console station hardware will facilitate producing all products desired. This was probably accomplished satisfactorily in the Baseline Exercises for sample system #1.

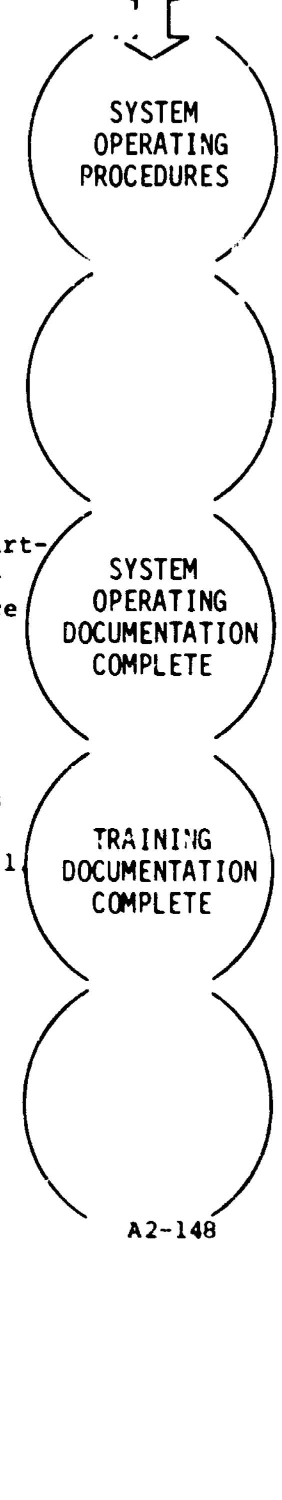
A check of the exact data flows at the console station should be made to verify that there are no display terminal features that are lacking.

SAMPLE SYSTEM # 2

All the varied formatted products must be produced satisfactorily at this point. Often the product requirements change instead of the system hardware having to change at this stage. This is a final check on product or output requirements being satisfied from a hardware capability standpoint.

A verification of the acceptability of all man-machine data flows is made with hardware performance and physical features in mind. This is a final, human engineering check on the hardware elements, plus a data flow efficiency check through hardware components only.





SAMPLE SYSTEM # 1

This step is more oriented towards overall policy and general organizational procedures and will not affect the hardware elements for sample system #1.

This step is a check on the completeness of hardware start-up, monitoring during operation, and shut-down reference documentation.

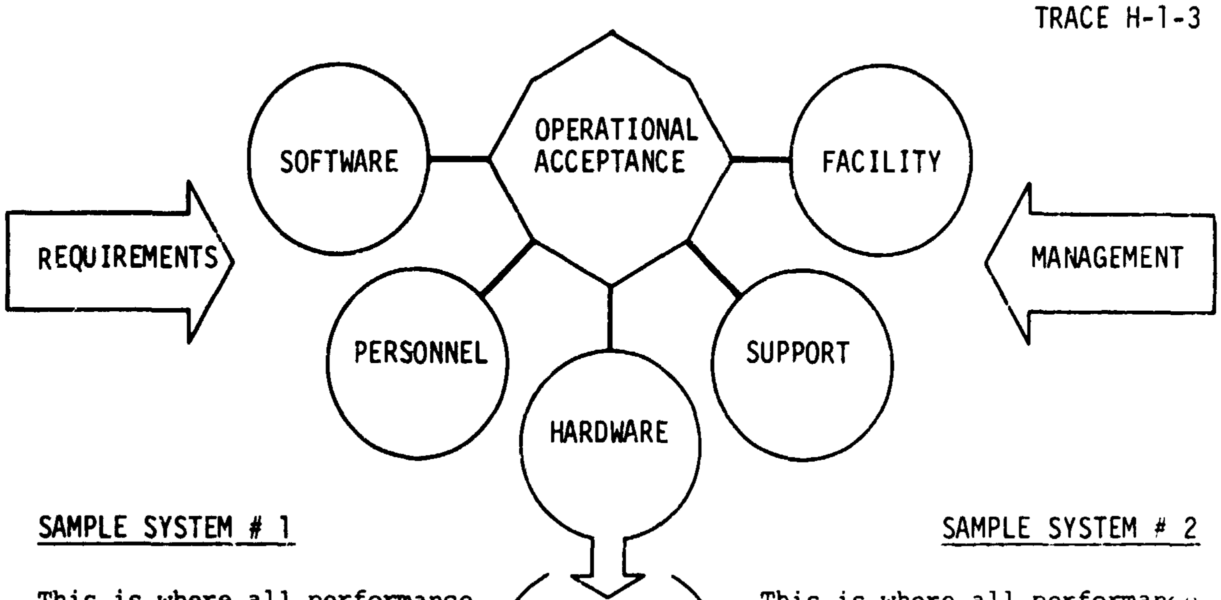
This step is a check on the training preparedness and is oriented towards hardware operation in sample system #1.

SAMPLE SYSTEM # 2

This is a policy or standard operating procedure generation effort which may describe how the hardware can be utilized in different system configurations under different conditions. This step is important and must be performed at this point for coordination and user acceptance.

This step is a check on the completeness of hardware start-up, monitoring during operation, and shut-down reference documentation.

This step is a check on the training preparedness and is oriented towards hardware operation in this case.



ACCEPTANCE TEST DEMONSTRATIONS

SAMPLE SYSTEM # 1

This is where all performance functions of the hardware are checked together with the supporting software. Coordination with other organizations can be effected at this time. If short demonstrations can be developed, management should see them.

SAMPLE SYSTEM # 2

This is where all performance functions of the hardware are checked together with the supporting software. Coordination with other organizations can be effected at this time. If short demonstrations can be developed, management should see them.

INTERFACE PROCEDURES

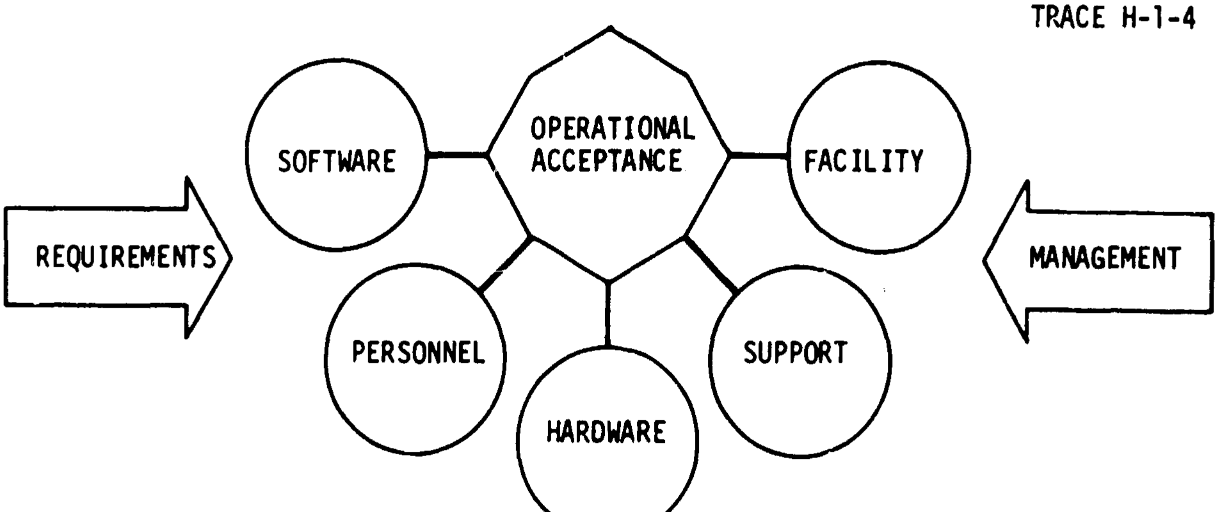
A final check on the console hardware connected to the computer should be performed if not previously done for sample system #1.

This step is an important effort for a large system. Inter-organizational and intra-systems interfaces should have standard operating procedures developed at this time. This facilitates support of hardware.

EXPANSION OR MODIFICATIONS

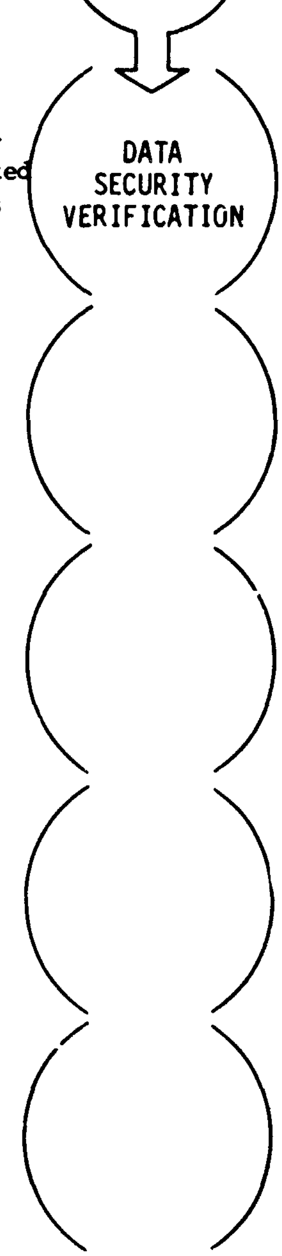
A review of proposed, individual hardware changes and changes in numbers of hardware components should be accomplished in view of the impact on the operation of the current, working system.

A review of proposed, individual hardware changes and changes in numbers of hardware components should be accomplished in view of the impact on the operation of the current, working system.



SAMPLE SYSTEM # 1

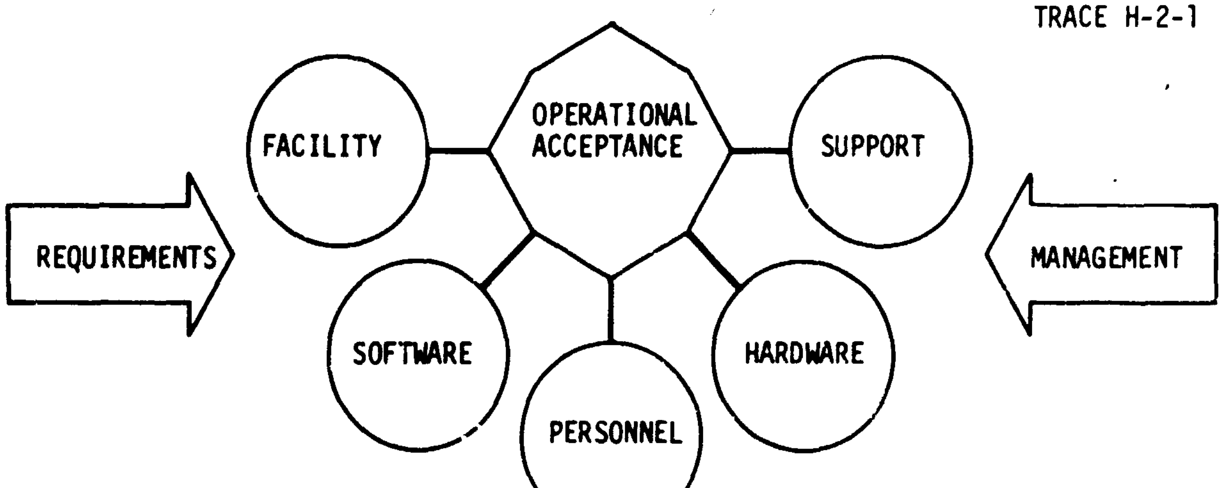
This is only applicable so far as validating that digital signals are not mis-routed or lost, causing data errors and the destruction of data files.

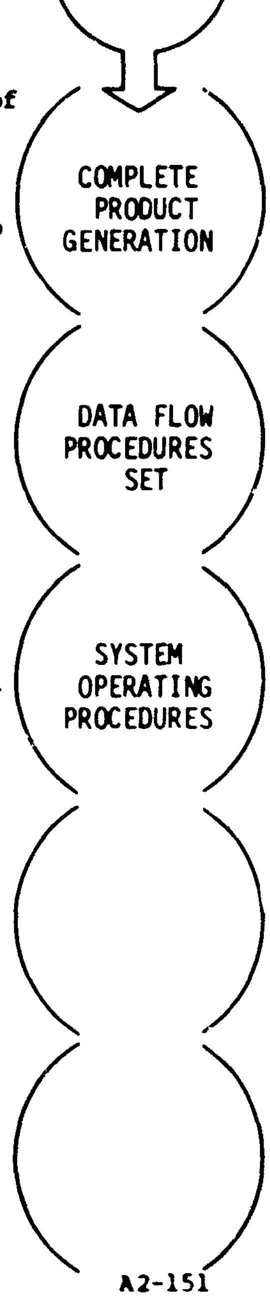


SAMPLE SYSTEM # 2

This is important in this military system for checking the hardware locks, security procedures used at terminals, shielding in hardware, etc.

TRACE H-2-1





SAMPLE SYSTEM # 1

This effort is a validation of the personnel skill levels needed to produce the required output with the system. It is an important step to perform at this time for future personnel acquisition planning.

This step is a final check on the man-machine work flow and related training and support given to the operator of the display station.

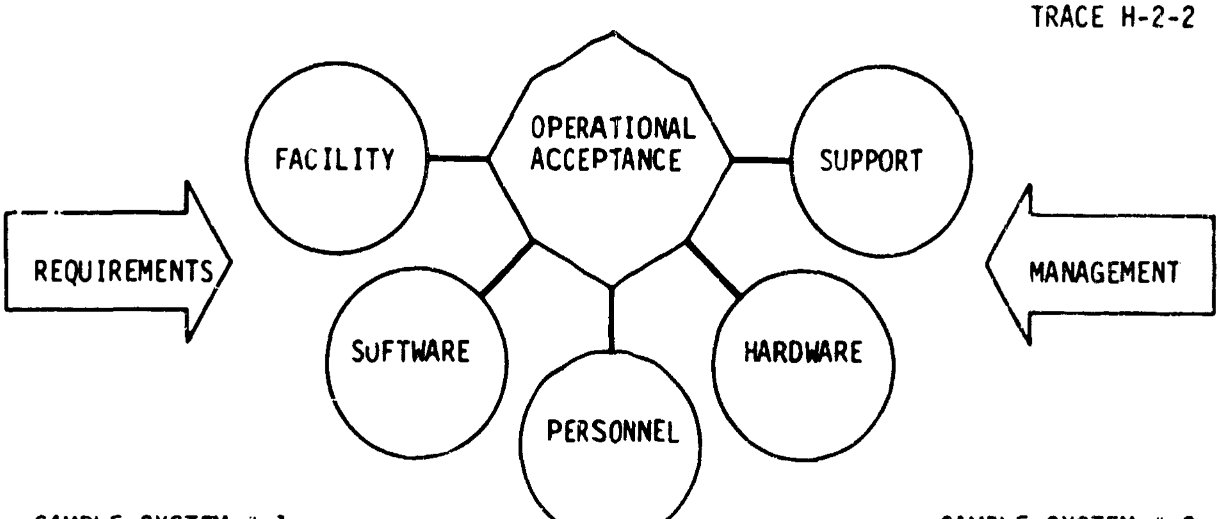
This step defines how the operator should conduct his shift activities at the display station. This is important to have in case substitute operators are needed without notice due to emergencies, etc.

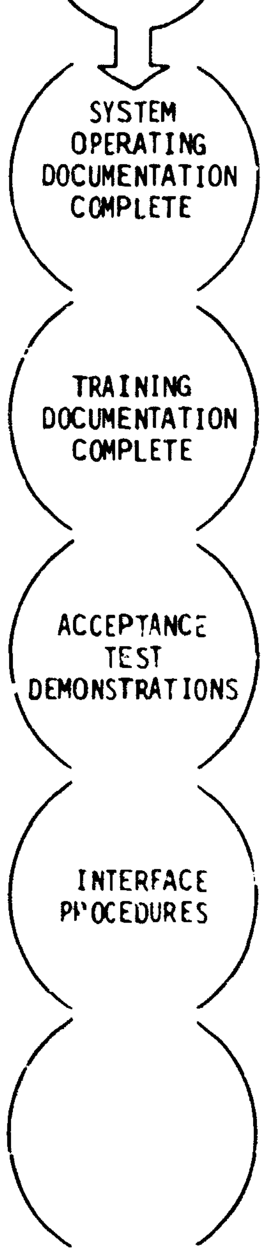
SAMPLE SYSTEM # 2

This effort is a validation of the personnel skill levels needed to produce the required output with the system. It is an important step to perform at this time for future personnel acquisition planning.

This establishes a final check on manning requirements and human engineering aspects of operator movements throughout the entire system.

This helps define administrative policies governing the cadre of personnel that will operate the system. Shift assignments, vacation schedules, and standby rosters are examples of items that are vital to a continuously operating system employing many individuals for long periods of time.





SAMPLE SYSTEM # 1

This step assures that user reference documentation is complete and normally eases the operators' effort over a period of time.

This step eases personnel training, of course, and facilitates substitute operators being used easily or more frequently with little effect on productivity.

This is an opportunity to interest potential operators and coordinate other system personnel that will be working with the console station operator(s).

This step is not significant for personnel elements in sample system #1.

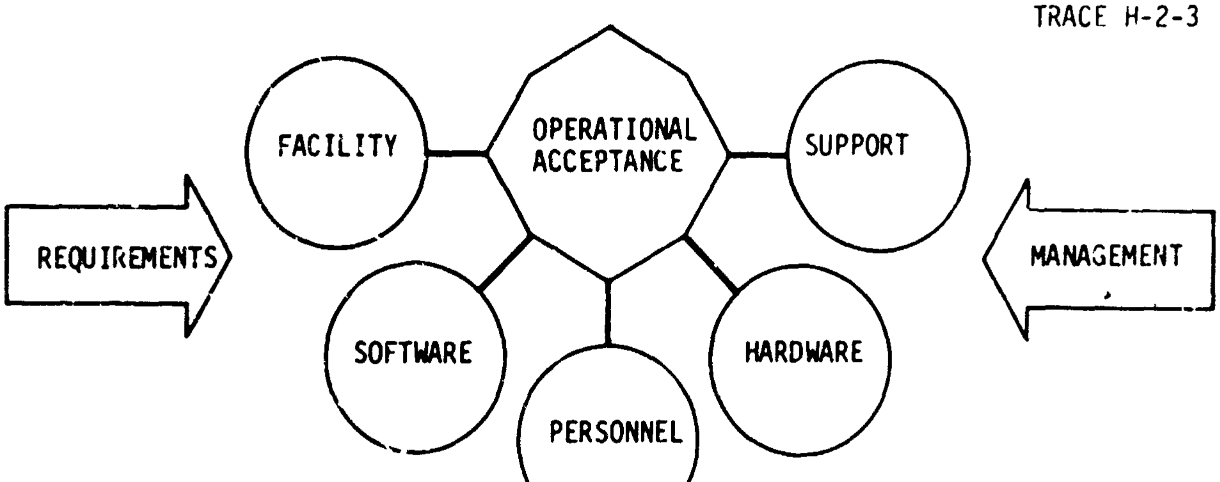
SAMPLE SYSTEM # 2

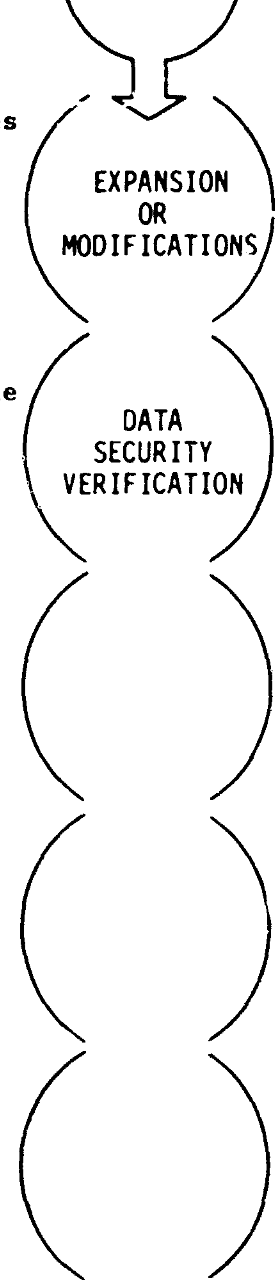
The step assures that user reference documentation is complete which normally eases the operators' effort over a period of time.

This step eases personnel training, of course, and facilitates substitute operators being used easily or more frequently with little effect on productivity.

This is an opportunity to interest potential operators and coordinate other system personnel that will be working at the various man-machine stations.

This is important to aid the resolution of inter-service or inter-command staffing plans. Training, education, transportation of personnel, etc., are required, and these often are dependent on many agencies for support to a system like this tactical mission analysis complex.





<u>SAMPLE SYSTEM # 1</u>

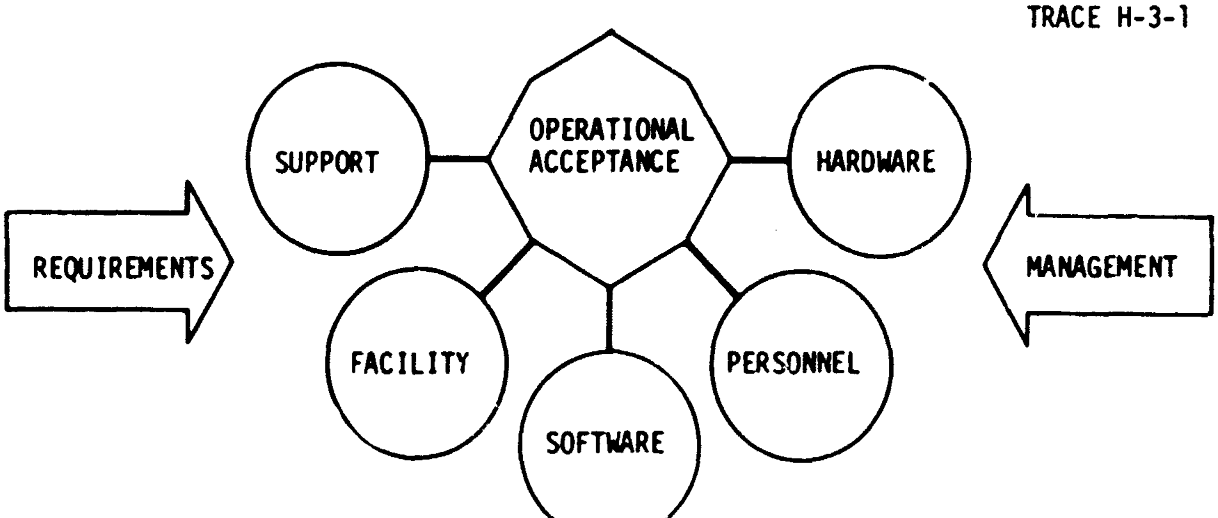
Future increases or decreases in operator, maintenance, and/or supply personnel may be indicated at this point.

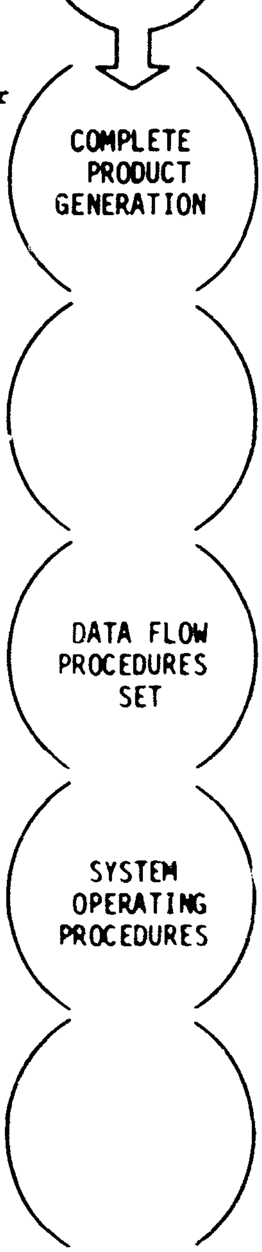
This is not applicable to personnel elements for sample system #1.

<u>SAMPLE SYSTEM # 2</u>

Future increases or decreases in operator, maintenance, and/or supply personnel may be indicated at this point.

Personnel check-in, console sign on and off, and administrative controls must be verified as adequate to maintain compliance with security regulations.





SAMPLE SYSTEM # 1

This step will be very similar to the Baseline Exercises; however, at this time, all application software should be done and checked. The files established by these application programs will be as needed in Baseline Exercises also.

This will be similar to the previous step because all that is checked in sample system #1 are the application programs that were prepared.

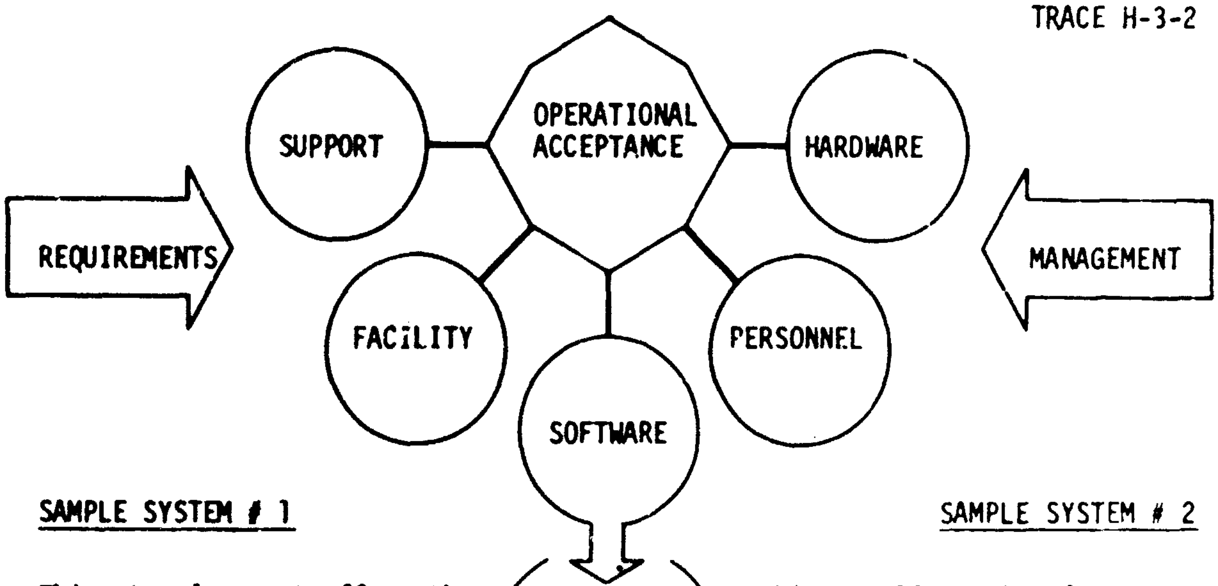
This does not affect the software elements for sample system #1.

SAMPLE SYSTEM # 2

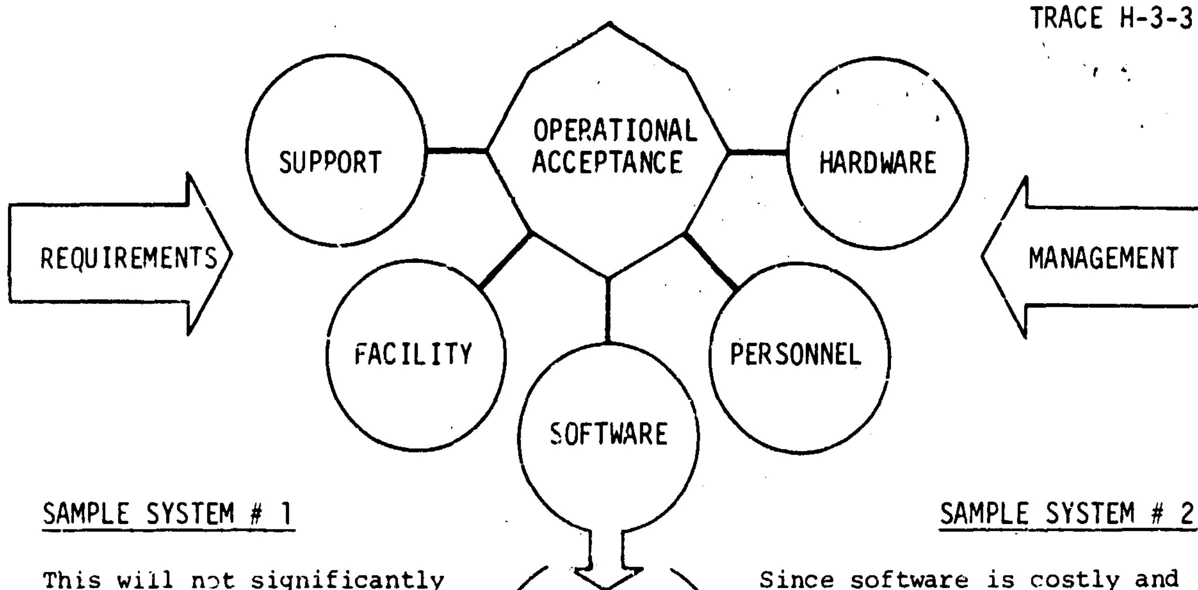
This step will be very similar to the Baseline Exercises; however, at this time, all application software should be done and checked. The files established by these application programs should be as needed in Baseline Exercises but will be more complete now.

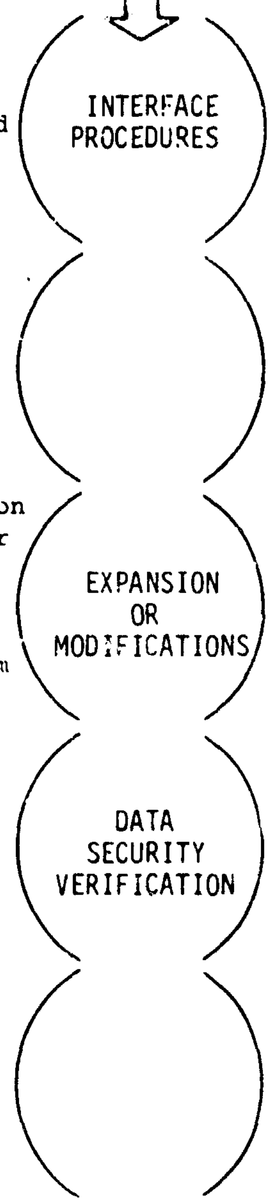
This will be an important check to make. It will be complimentary to the previous steps, because it mainly affects the application programs. The data base will also be validated for future use here.

This should result after completion of the previous step. Since this system will have data processing support provided to many of the functional areas, the related software interfaces to the functional areas' operating procedures should be documented.



SAMPLE SYSTEM # 1		SAMPLE SYSTEM # 2
This step does not affect the software elements for sample system #1.	SYSTEM OPERATING DOCUMENTATION COMPLETE	This should result after completion of the previous step. Since this system will have data processing support provided to many of the functional areas, the related software interfaces to the functional areas' operating procedures should be documented.
This step should coordinate the software documentation to assure that references and software-related training aspects are correct and well-described.	TRAINING DOCUMENTATION COMPLETE	This step should coordinate the software documentation to assure that references and software-related training aspects are correct and well-described.
This step will validate the application programs as being correct and efficient for the man-machine operations to be performed at the CRT display console.	ACCEPTANCE TEST DEMONSTRATIONS	The sub-sets of the software must be demonstrated against previously generated and approved test plans. Management and user participation in key functional areas is important to make known the software advantages in this system, future software needed, or software relationships to other projects and systems.





INTERFACE PROCEDURES

SAMPLE SYSTEM # 1

This will not significantly affect the software elements for sample system #1 at this point, because electrical and logic interfaces within the system have already been checked during Baseline Implementation.

SAMPLE SYSTEM # 2

Since software is costly and time-consuming to produce, any sharing of programs that can be achieved should be fostered. More important is that interface organizations know about the existing software and know how to coordinate with this system for data exchange whether they use the same programs or not.

EXPANSION OR MODIFICATIONS

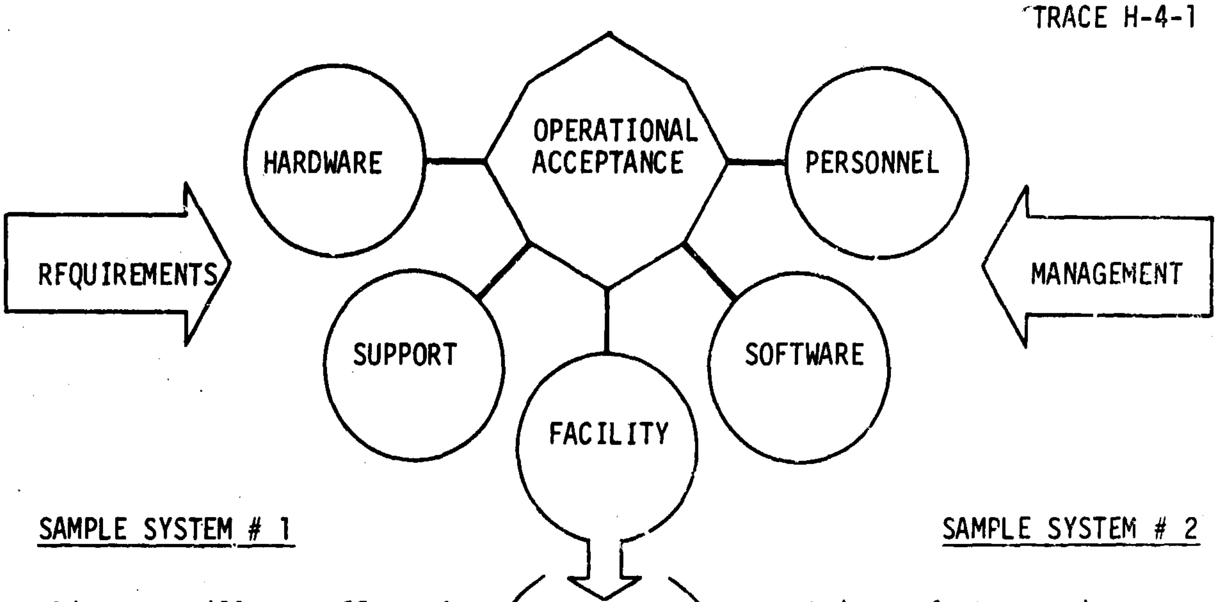
Sample System # 1: Any modifications or expansion efforts will have to consider the current software. This is a key step to perform, relative to the application software and operating system software.

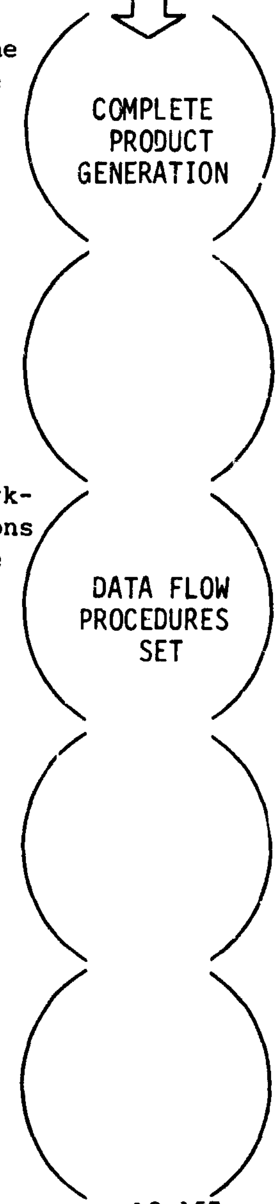
Sample System # 2: Any modifications or expansion efforts will have to consider the current software. This is a key step to perform relative to the application software and operating system software.

DATA SECURITY VERIFICATION

Sample System # 1: This step has no effect on the software elements for sample system #1.

Sample System # 2: This is important to check where program lock-out techniques or file validity checks are made in support of security needs.





SAMPLE SYSTEM # 1

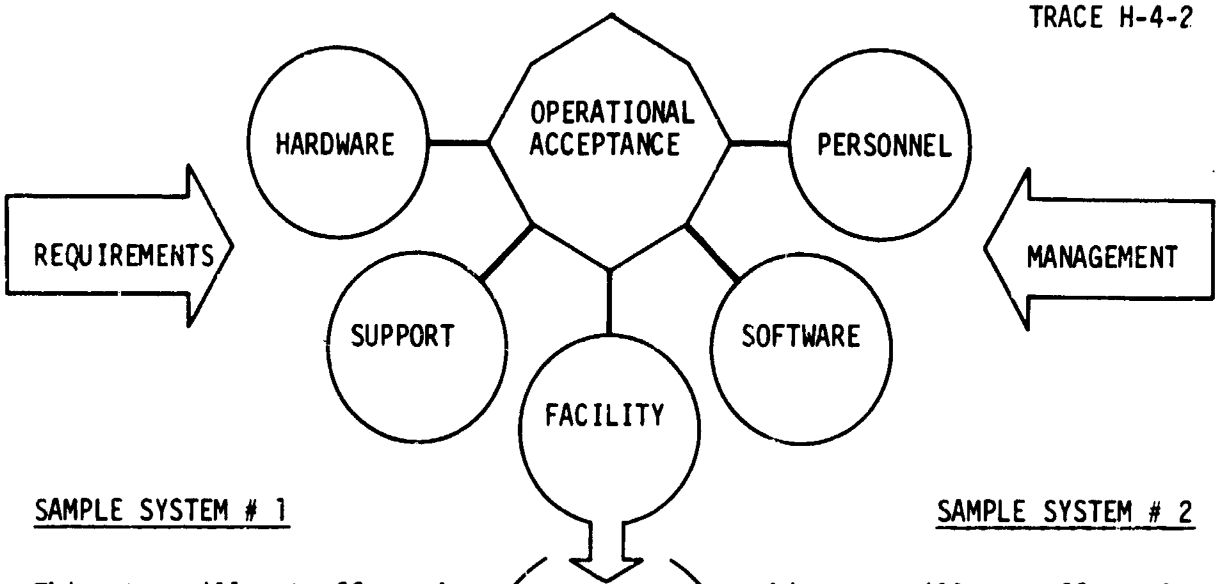
This step will not affect the facility elements for sample system #1.

This step will check the working area and any modifications as being adequate for sample system #1.

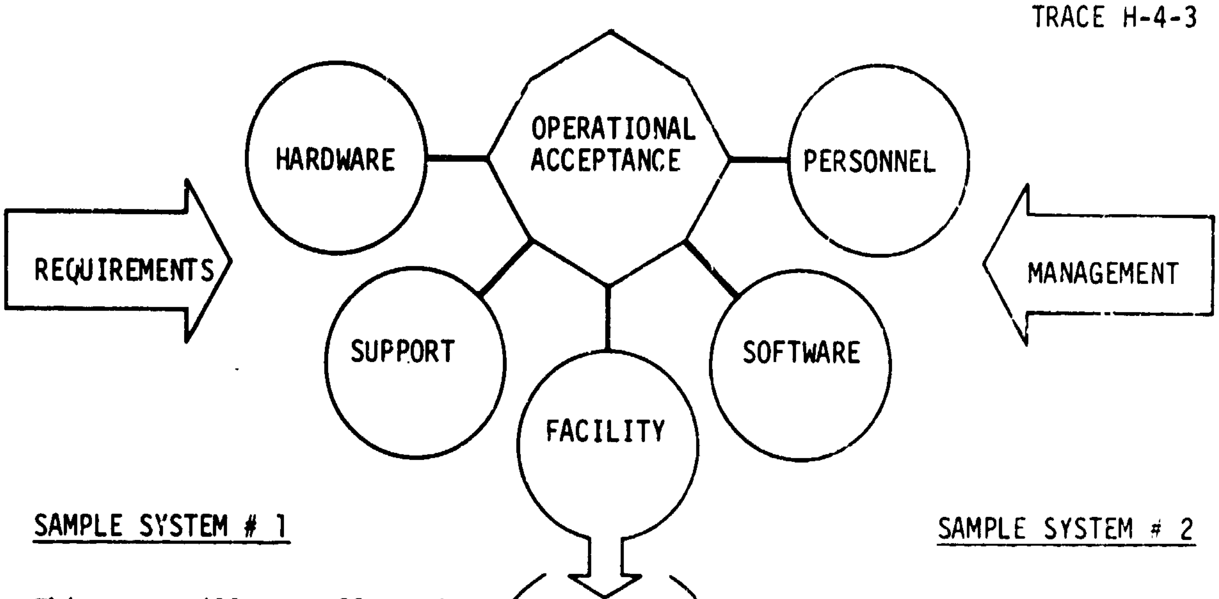
SAMPLE SYSTEM # 2

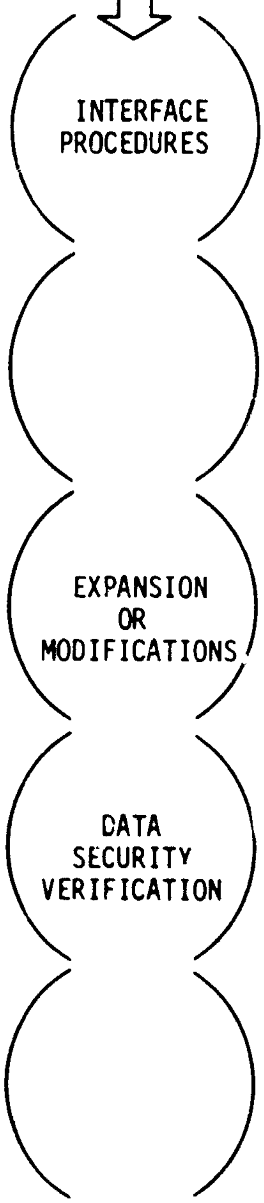
Certain products require special supply storage, large space for handling or shipping, and many people to help produce the item being generated. The facility elements could be taxed for the first time at this point, and this should be known prior to all facility preparation support being released.

This step should finalize the internal layout of the system's facility or connections between individual portions of the facility. This should be analyzed carefully prior to sign off on construction, because future facility changes and construction start-ups are very costly and cause very harmful affects on production operations.



SAMPLE SYSTEM # 1		SAMPLE SYSTEM # 2
This step will not affect the facility elements for sample system #1.	SYSTEM OPERATING PROCEDURES	This step will not affect the facility elements differently than the previous step, except to clarify who is responsible for facility management, upkeep, and security control.
This step will not affect the facility elements for sample system #1.	SYSTEM OPERATING DOCUMENTATION COMPLETE	This step will result in the official records for guiding the care of the facility which houses the system.
This step will not affect the facility elements for sample system #1.	TRAINING DOCUMENTATION COMPLETE	This will affect the facility elements if a special facility, like a shelter is used for part or all of the facility for this system. Some training will require facility operation and maintenance data in this latter case.
This step will not affect the facility elements for sample system #1.	ACCEPTANCE TEST DEMONSTRATIONS	This step will be a final check of facility acceptability and a point where most management or coordinating groups will have a chance to examine the facility Bad facility elements will be quickly identified by demonstration observers before other parts of the system are operated; therefore, completeness is important at this point.





SAMPLE SYSTEM # 1

This step will not affect the facility elements for sample system #1.

This step will cause a re-evaluation of the work station area and should be documented for later use.

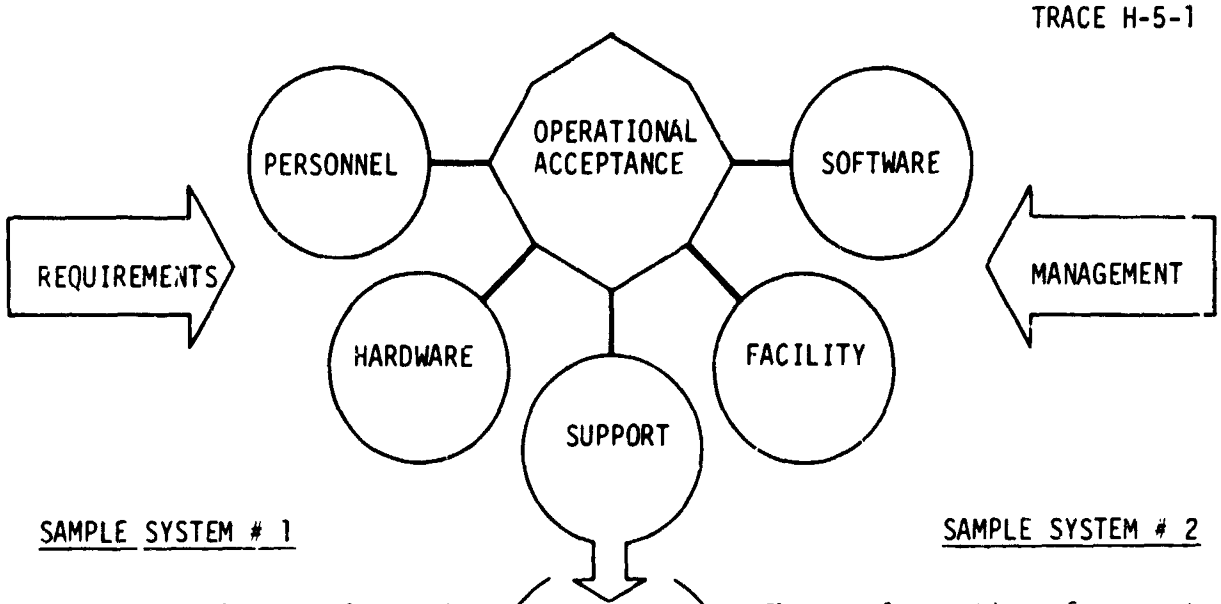
This step will not affect the facility elements of sample system #1.

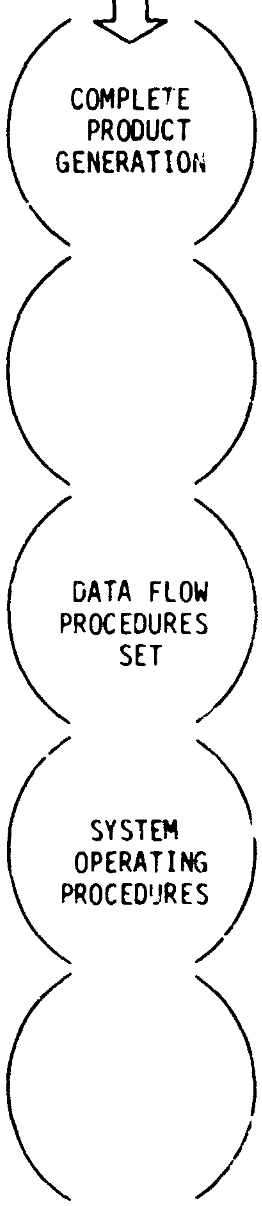
SAMPLE SYSTEM # 2

Since a great volume of multi-security level data will be going in and out of the facility, the shipment and receiving areas must be reviewed for acceptability. The location of briefing rooms, communication areas, etc., will be vital to the success of this system; therefore, the internal and external interfaces must be carefully checked during early stages of the Operational Acceptance Task.

Any such plans as these must take the facility into consideration. Waivers to facility specifications may be needed in view of an expansion program to be implemented in the near future.

Shielding, cabling, vaulted area safeguards, and physical guard stations should be checked carefully to assure that the facility is properly constructed and utilized to maintain the levels of security at the right places, at the right times, and most efficiently.





SAMPLE SYSTEM # 1

This step will not affect the support elements for sample system #1.

This step will help validate the supply needs for sample system #1.

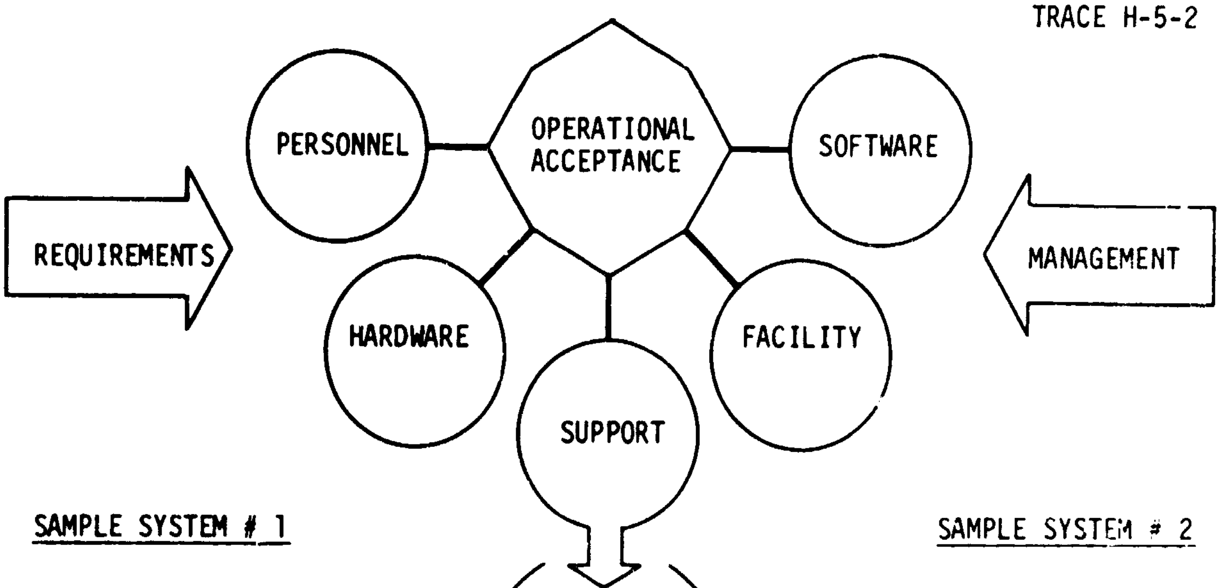
This step will help validate the supply and maintenance needs for sample system #1.

SAMPLE SYSTEM # 2

The supply portion of support will certainly be checked by this step. Some equipment that has been infrequently used to date should be made to operate if they directly affect the product generation capability. This is necessary to lend confidence to reliability figures as they affect maintenance and spare parts under all operating circumstances.

This step will help validate the supply needs for sample system #2.

This step will help validate the supply and maintenance needs for sample system #2.



SYSTEM OPERATING DOCUMENTATION COMPLETE

SAMPLE SYSTEM # 1

This step will only help a new operator know what must be done as far as supplies are concerned if the situation occurs where the well-trained operator suddenly is unavailable.

SAMPLE SYSTEM # 2

This step will only help a new operator know what must be done as far as supplies are concerned if the situation occurs where the well-trained operator suddenly is unavailable.

TRAINING DOCUMENTATION COMPLETE

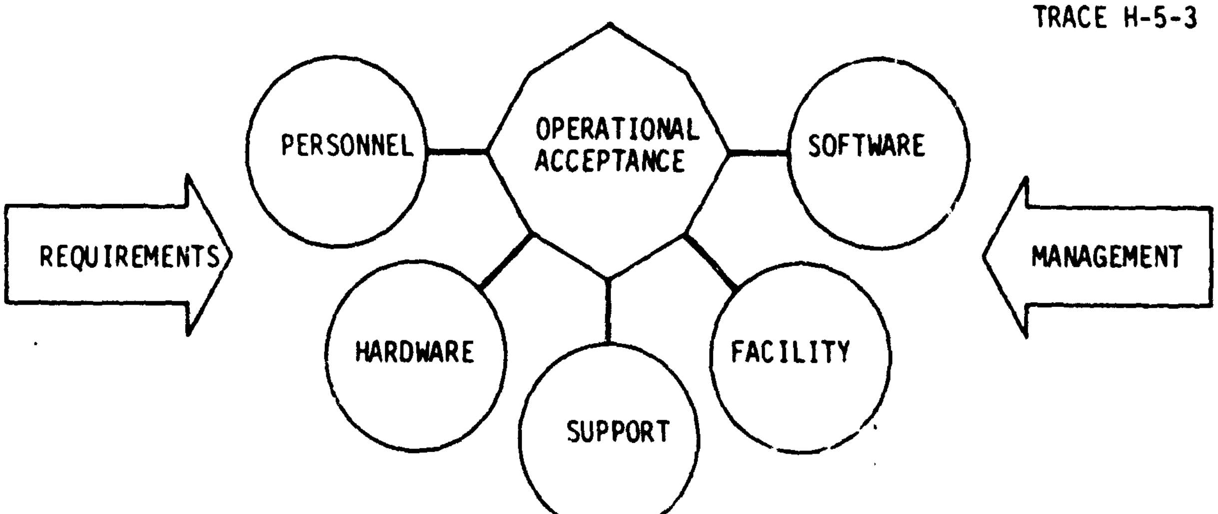
Sample System # 1: This step will only help a new operator know what must be done as far as supplies are concerned if the situation occurs where the well-trained operator suddenly is unavailable.

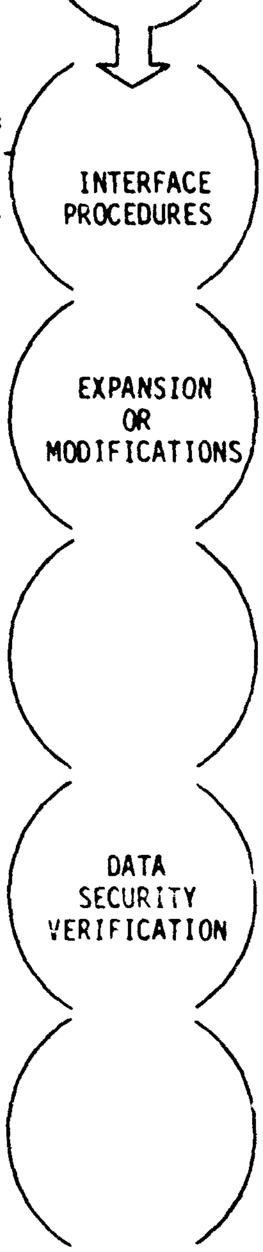
Sample System # 2: This step will only help a new operator know what must be done as far as supplies are concerned if the situation occurs where the well-trained operator suddenly is unavailable.

ACCEPTANCE TEST DEMONSTRATIONS

Sample System # 1: This will exercise the supply account, maintenance sources, and spare parts inventory and may be the step which helps to raise procurement priorities for support elements to this system.

Sample System # 2: This will exercise the supply account, maintenance sources, and spare parts inventory and may be the step which helps to raise procurement priorities for support elements to this system.





SAMPLE SYSTEM # 1

This step has minor significance to the support elements unless procurement or contractor interfaces need further coordination on their respective jobs in support of the system.

This step will be necessary if expansion or modifications are contemplated. The support stock may be held to a low level until the expansion is done, at which time more long-term operational supply accounts will be needed.

This is not applicable for sample system #1.

SAMPLE SYSTEM # 2

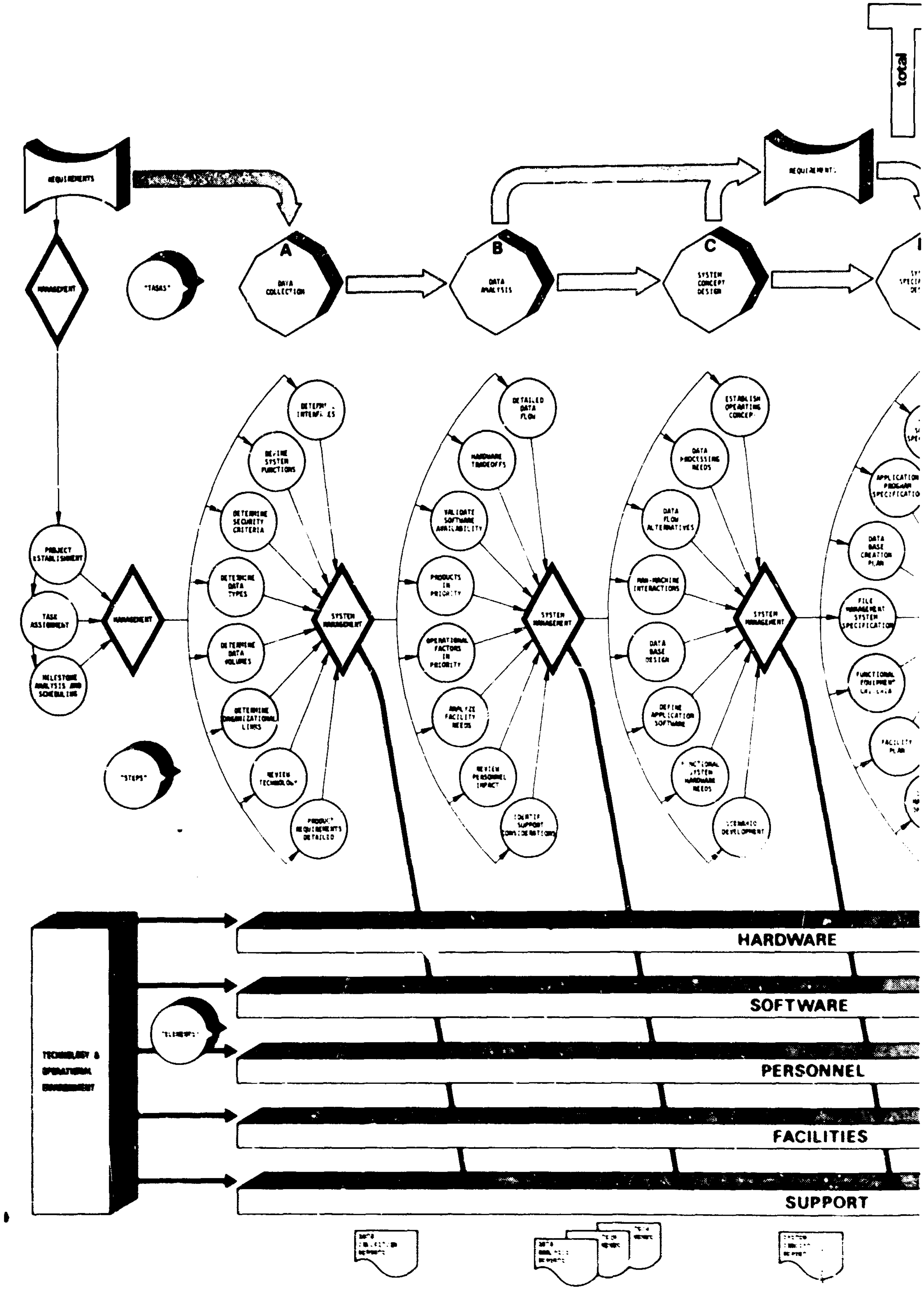
This is a step of major importance for a system like this. Many critical support elements are provided by outside organizations for a tactical system, and these interfaces should be clearly operational prior to system acceptance by the user.

This step is also important, because,

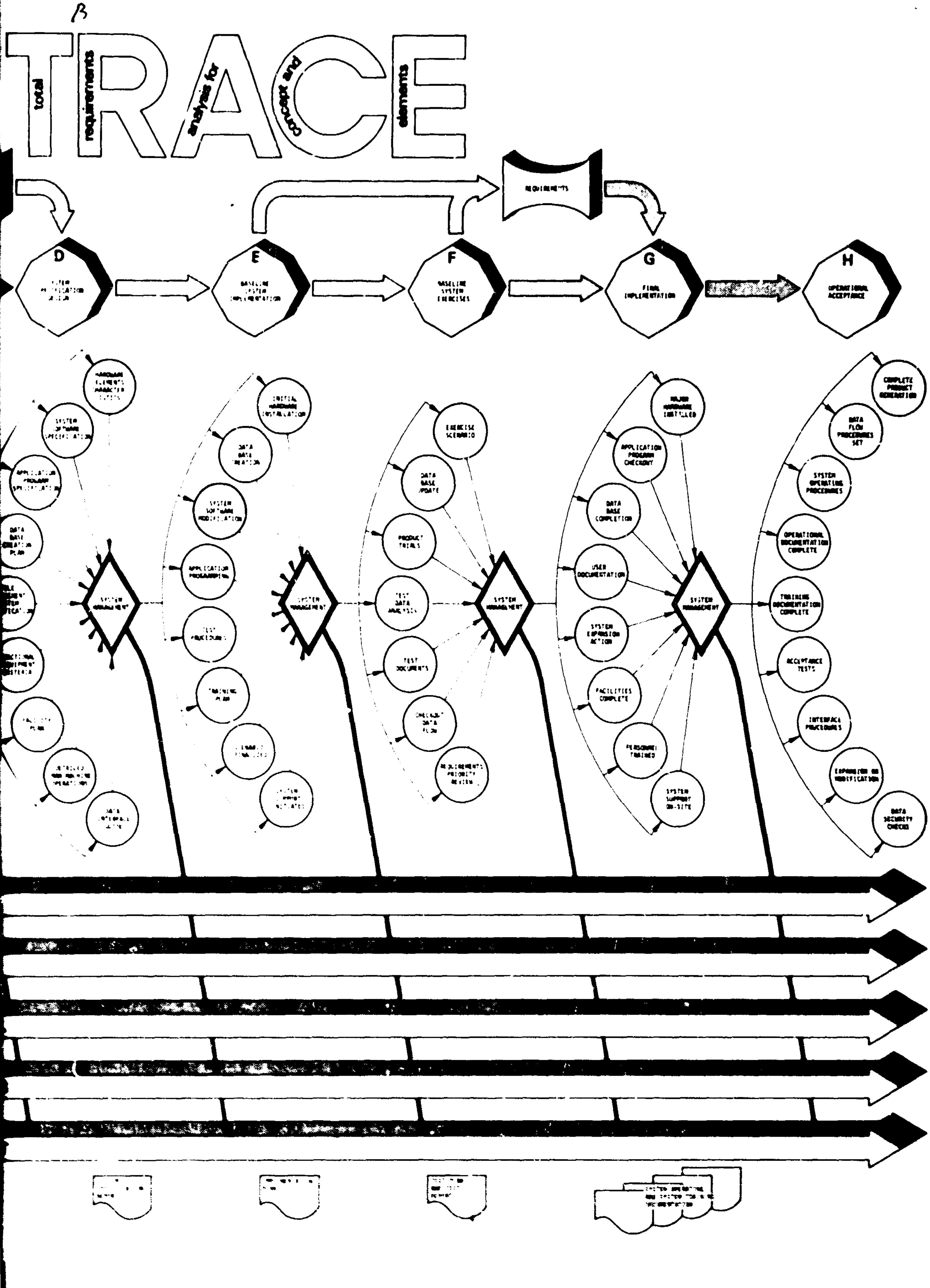
1) A large system usually is in the process of expansion or modification at this point, and
2) Any such action will affect supply, maintenance, and other support elements almost immediately.

This is an important final step to assure that support elements that provide security checks are adequate and will be continually satisfactory. Periodic inspections, maintenance to alarm systems, and shipping supplies used for the protection of "high level" classified materials are examples of these elements.

A



total
REQUIREMENTS
MANAGEMENT
"TASKS"
A
DATA COLLECTION
B
DATA ANALYSIS
C
SYSTEM CONCEPT DESIGN
REQUIREMENTS
DEFINE SYSTEM FUNCTIONS
DETERMINE SECURITY CRITERIA
DETERMINE DATA TYPES
DETERMINE DATA VOLUMES
DETERMINE ORGANIZATIONAL LINKS
REVIEW TECHNOLOGY
PRODUCT REQUIREMENTS DETAILED
SYSTEM MANAGEMENT
DETAILED DATA FLOW
HARDWARE TRADEOFFS
VALIDATE SOFTWARE AVAILABILITY
PRODUCTS IN PRIORITY
OPERATIONAL FACTORS IN PRIORITY
ANALYZE FACILITY NEEDS
REVIEW PERSONNEL IMPACT
SYSTEM MANAGEMENT
ESTABLISH OPERATING CONCEPT
DATA PROCESSING NEEDS
DATA FLOW ALTERNATIVES
MAN-MACHINE INTERACTIONS
DATA BASE DESIGN
DEFINE APPLICATION SOFTWARE
SYSTEM MANAGEMENT
APPLICATION PROGRAM SPECIFICATION
DATA BASE CREATION PLAN
FILE MANAGEMENT SYSTEM SPECIFICATION
FACILITY PLAN
PROJECT ESTABLISHMENT
TASK ASSIGNMENT
MILESTONE ANALYSIS AND SCHEDULING
MANAGEMENT
"STEPS"
HARDWARE
SOFTWARE
PERSONNEL
FACILITIES
SUPPORT
TECHNOLOGY & OPERATIONAL ENVIRONMENT


TRACE
total
requirements
analysis for
concept and
elements
REQUIREMENTS
D
E
BASELINE SYSTEM IMPLEMENTATION
F
BASELINE SYSTEM EXERCISES
G
FINAL IMPLEMENTATION
H
OPERATIONAL ACCEPTANCE
SYSTEM SOFTWARE SPECIFICATION
APPLICATION PROGRAM SPECIFICATION
DATA BASE CREATION PLAN
FACILITY PLAN
INITIAL HARDWARE INSTALLATION
DATA BASE CREATION
SYSTEM SOFTWARE MODIFICATION
APPLICATION PROGRAMMING
TEST PROCEDURES
TRAINING PLAN
EXERCISE SCENARIO
DATA BASE UPDATE
PRODUCT TRIALS
TEST DATA ANALYSIS
TEST DOCUMENTS
CHECKOUT DATA FLOW
REQUIREMENTS PRIORITY REVIEW
MAJOR HARDWARE INSTALLED
APPLICATION PROGRAM CHECKOUT
DATA BASE COMPLETION
USER DOCUMENTATION
SYSTEM EXPANSION ACTION
FACILITIES COMPLETE
PERSONNEL TRAINED
SYSTEM SUPPORT ON-SITE
COMPLETE PRODUCT GENERATION
DATA FLOW PROCEDURES SET
SYSTEM OPERATING PROCEDURES
OPERATIONAL DOCUMENTATION COMPLETE
TRAINING DOCUMENTATION COMPLETE
ACCEPTANCE TESTS
INTERFACE PROCEDURES
EXPANSION OR MODIFICATION
DATA SECURITY CHECKS
SYSTEM MANAGEMENT